The Foundry

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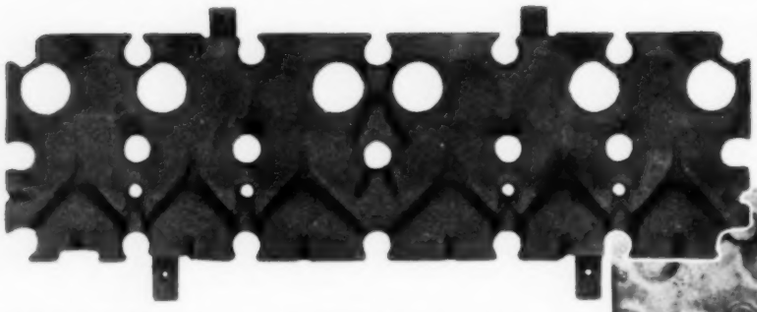

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Lakey Foundry & Machine Co.
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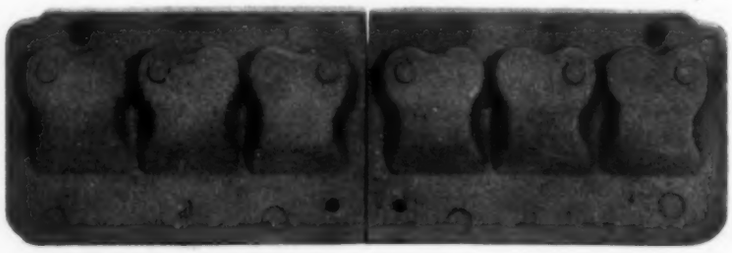

Core for drag or combustion side of cylinder head for Terraplane. The clutch housing, and the water jacket cylinder head core and casting at top of page are for the new Hudson 112.

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The Foundry Editorial

Gray Iron Industry Needs Research Program

PROGRESS in the gray iron foundry during recent years should be exceptionally gratifying to all who have labored diligently in the common cause. In a comparatively short period, as measured in the life of that industry, gray iron foundrymen have discarded rule of thumb methods and have applied principles of modern engineering knowledge to both practices and product. As a prominent foundry metallurgist has said on several occasions, more has been added to the literature of gray cast iron during the past 10 or 12 years than in all the previous years that iron was cast in molds.

In common with all industrial concerns the foundry today has two distinct divisions to its business, namely manufacturing and selling. If either part of the commercial enterprise fails to realize maximum efficiency, the foundry will fall short of successful operation and at the same time will penalize the entire industry. Modern business is geared to the principle of mass production of quality goods at a price within the reach of mass buying. This has been the underlying factor governing developments in the foundry industry in recent years.

Early progress in the gray iron foundry consisted mainly of improvements in practice, and this phase has been intensified as the work progressed. The American Foundrymen's association has been a leader in this endeavor. Through the work of many committees and knowledge made available to the industry in a wide variety of technical papers presented at annual conventions, and more recently before regional conferences and regular chapter meetings, every foundry in the country has had some necessary information on modernization. Foundrymen also are indebted greatly to manufacturers of supplies and equipment who have invested generously in time and money to develop materials and machines vital to modern practices.

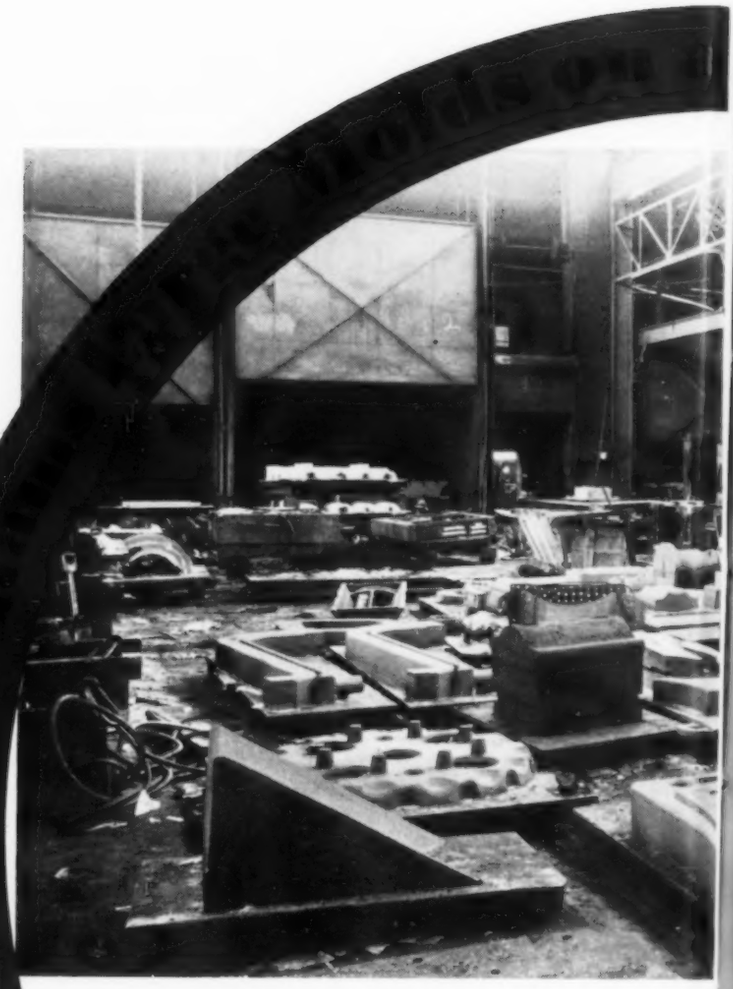
Remarkable improvement in properties of gray iron castings has been even more spectacular. Through research, improvement in practices, application of the knowledge of metallurgy, use of alloys, better raw materials, development of heat treatments, and other factors, gray iron castings are produced today with strengths and other characteristics far in excess of even the most visionary a few short years ago. Foundries produce gray iron castings having physical and structural properties capable of meeting the most stringent modern engineering requirements. While credit for these developments rests in the main with highly progressive individual foundries, most of present day knowledge gladly has been made available to both foundries and engineers. The *Cast Metals Handbook,* published in 1935 and now in the process of revision for a second edition, has contributed greatly to a better understanding among designing engineers of the possibilities of all types of castings.

If the gray iron industry is to continue its march of progress, future studies must be directed to the correlation of present possibilities in castings properties with the needs of the entire industrial world. This cannot be accomplished individually. The problem is too great and the cost too excessive. An adequate research program must be undertaken by the industry as a whole. To meet the needs of present customers and to find new uses for gray iron castings in an ever changing civilization, joint research is mandatory. As an example, consider the possibilities afforded in the damping capacity of gray iron. Complete knowledge of that one property in the hands of all designing engineers practically would subdue competition of welded structures in the field of machinery construction.

Gray iron foundrymen profitably could emulate the malleable branch of the industry. A. F. Jackson, vice president, Michigan Malleable Iron Co., Detroit, and president, Malleable Founders' society recently addressed the society's committee on new uses as follows: "Industry can developed new markets and expand its value to society only by continuing to apply scientific research to its every day problems. In line with this belief, the society is studying plans to extend its research activities."

Frank G. Steinebach
Editor

By PAT DWYER



LACKING any evidence of prior claim, the invention of the lever, the screw, the pulley and other forms of prime mechanical devices, usually is ascribed to Archimedes, apparently a very learned citizen who flourished more than 200 years before the beginning of the Christian era. Post office address, the ancient and famous city of Syracuse, Island of Sicily in the Mediterranean, close to the toe of the Italian boot.

The ordinary citizen whose knowledge of European history and geography is slightly more hazy, if possible, than his knowledge of the history and geography of his own land, may wonder what an eminent scholar with a distinctly Greek name was doing in Sicily. If the citizen is sufficiently interested to turn to the proper page in the encyclopedia, he will find that the island of Sicily has been the landing and jumping off place for a greater variety of races than the variety of animals Noah had in the ark during a certain rainy season. Before the Romans grabbed — or should it be annexed? — it in 212 B.C., the island was a Greek possession with a Greek population.

In common with ancient and modern philosophers and scientists, Archimedes was a prolific writing man. Copies of highly erudite treatises on abstruse phenomena may be found on a few library shelves — covered with dust. They have no interest for the average man, the typical individual who says: "Archimedes? Let's see. Wasn't he the guy in the bath tub who discovered perpetual motion or specific gravity or something and then jumped out of the tub hollering 'Eureka!?' "

The engineering fraternity and a few other people here and there are familiar with another alleged remark of the distinguished inventor and scholar. Discussing the use of and principle of the lever before the usual audience of skeptics, he claimed that if he had a suitable fulcrum and a lever long enough and strong enough, he could move the earth. History is discreetly silent on whether any of the skeptics inquired where the lever man was going to stand during the performance.

D. M. Whyte, general foundry superintendent, Cooper-Bessemer Corp., operating foundries in Mt.

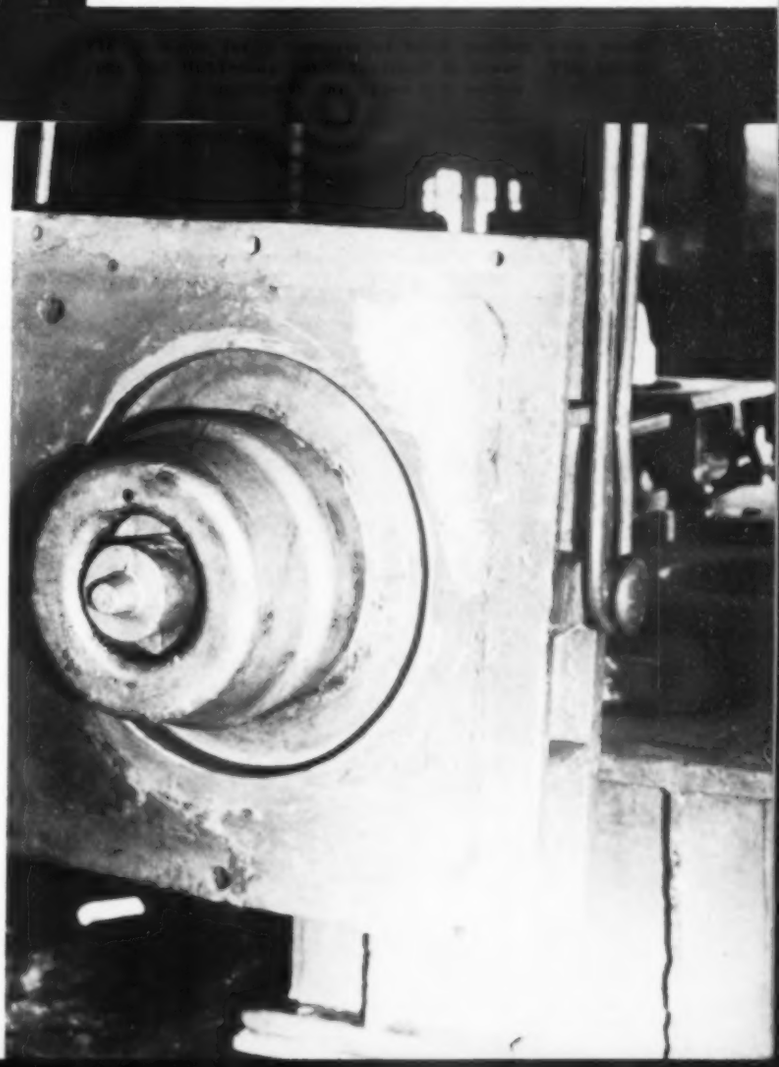
Fig. 1—The coremaking department, with core ovens in the background, is located at one end of the foundry. Most of the cores are faced with oil sand while the inside is filled with a less expensive mixture of old sand

Vernon, O., and Grove City, Pa., and incidentally a possible descendant of Archimedes on the Scottish or collateral side, has had some experience lifting weights in a field usually considered outside the range of practical accomplishment. Faced with the problem of producing large engine bed castings, he reasoned that if he had a molding machine large enough and powerful enough to lift and jolt the load, he could effect substantial savings in time and in production cost. From many years experience with molding machines he knew that a few hearty jolts would take the place of long hours and laborious ramming by hand. As a result of this line of reasoning he secured and installed in the Mt. Vernon plant what is claimed to be the largest and most powerful jolt ramming machine in operation.

Formerly the large engine bed castings were molded in large pits in the foundry floor. After the pattern was removed and the mold finished, the face was covered with wet blacking. The upper part of the mold was covered and the sand was dried to a depth of several inches.

Essentially the proposition of mounting the pattern on a plate, ramming the mold and rolling it over, does not differ from that involved in dealing with smaller units. However, in this instance the great weight presented many factors which exerted a direct bearing on the problem. To prevent sagging or warping, also to resist the weight and pressure of the metal when the mold is filled with iron, an unusually strong and rigid flask is required. The present flask, flanged top and bottom and heavily ribbed on the outside is 20 feet in length, 9 feet wide and 6 feet deep, estimated weight 55,000 pounds. Weight of drag filled with sand and ready for the drying oven is estimated at approximately 57 tons.

The flask was molded in green sand with a row of dry sand cores on the lower, outside edge to form the bottom flange. Dry sand cores laid up against the pattern at designated points on the outside formed the loop handles to which the crane chains are attached for rolling the drag, for transporting it to and from the drying oven and for lowering it into the pit in the floor, where the mold is cored, closed and made ready for reception of



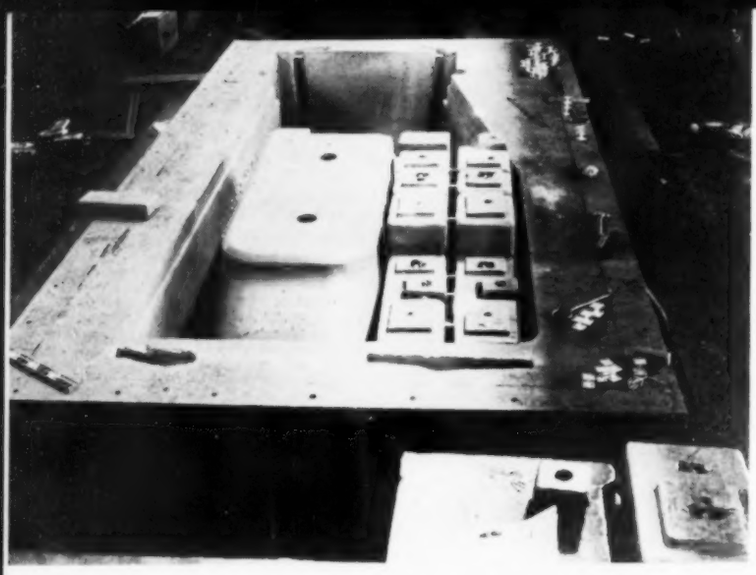


Fig. 4—Drag of large engine bed mold is lowered into a pit in the floor for convenience in setting the dry sand cores

the iron poured into the mold from both ends.

Pattern plate and bottom plate for the flask were cast face up in open green sand molds. The same care and attention is given to the production of this class of castings as is accorded to castings made to order for outside customers. As a result the plates for this and other flasks are straight, of uniform thickness, clean and smooth enough on the upper face to require only a single machining cut before they are placed in service. Formation of blowholes, scum and dirt are prevented by venting the molds properly. The face of the mold is blacked and then sprayed with a thin solution of molasses water or other water soluble binder. By allowing the mold to stand for a few hours, or preferably until the following day before it is filled with metal, the skin becomes air dried to a certain extent and thereby

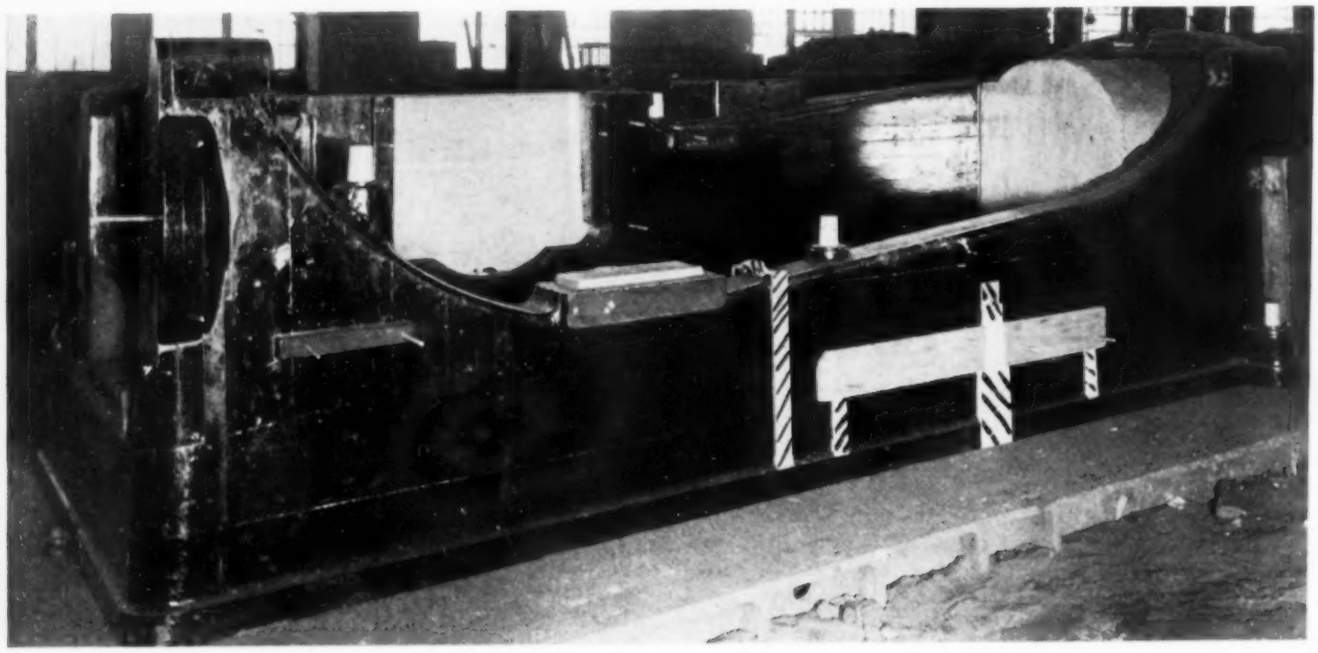
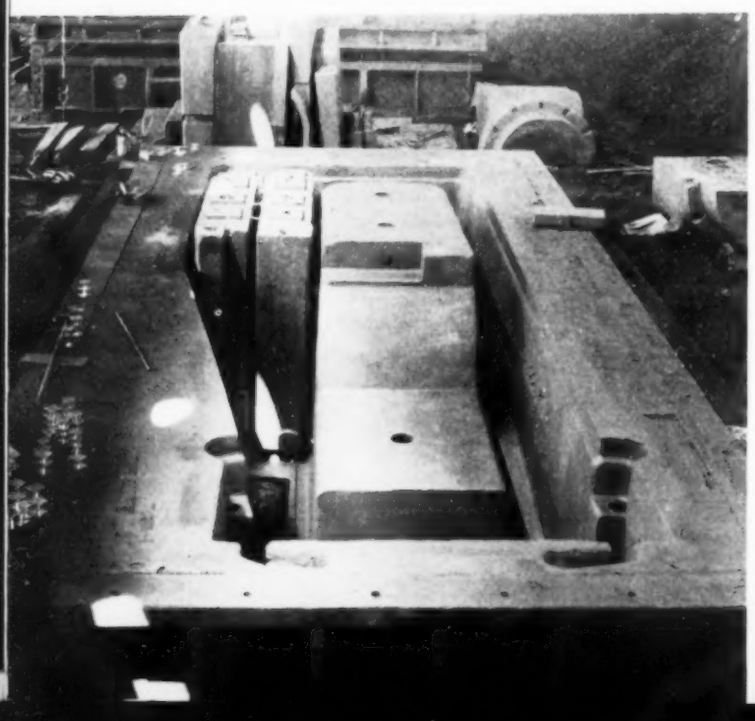


Fig. 5 (Above)—The engine bed pattern is mounted on a heavily ribbed, planed cast iron plate. Fig. 6 (Below)—View from opposite end of the same mold shown in Fig. 4. Cores are held in place by chaplets on bottom, top and sides



prevents erosion from the flowing metal, also presents a better surface on which the iron lies quietly. After the plates are cast they are covered with sand and then a space approximately 1-foot wide is stripped across them diagonally from opposite corners. The object is to synchronize the cooling speed on both sides of the plate and thus prevent the casting from warping.

The large flask for the engine bed was planed on top and bottom flanges. The same practice is followed on practically all the flasks used in the foundry and is in line with the general policy of providing reliable equipment and thus obviate one of the hazards incident to the production of high-grade castings. Many of the hazards incident to the presence of moisture in the sand are removed by drying the molds. Some of the smaller castings are molded in green sand, but the great majority, approximately 95 per cent of the tonnage in this foundry is dried.

In passing it is interesting to note that all the large castings on the (*Please turn to page* 66)

Air view down town Cleveland showing Public Hall in the left center foreground

Committees Plan Cleveland A.F.A. Convention Activities

COMMITTEES of the American Foundrymen's association and the Northeastern Ohio chapter of the A.F.A. are moving forward rapidly with plans for various features of the coming annual convention of the A.F.A. to be held in Cleveland, May 14 to 19. According to Technical Secretary Robert E. Kennedy, the program of meetings will be extensive with 35 sessions covering management, technical phases, production and shop practice discussions. Round table conferences will relate to steel, malleable, nonferrous and gray iron foundry practice.

Sessions on management will feature speakers on apprentice and foreman training, foundry safety and hygiene, melting costs, job evaluation and time study. General interest technical sessions listed by the program committee include those on foundry refractories, sand research and control, patternmaking and material handling. Meetings of particular interest to gray iron and nonferrous foundrymen are being arranged for the first two days and those for steel foundrymen on the second and third days, and for malleable foundrymen on the third and fourth days. The tentative schedule of sessions for the convention is given on page 62 of this issue of THE FOUNDRY. As will be noted, the committee has arranged a program to provide simultaneous sessions with the least possible conflict of interests.

Three shop operation courses are being offered, covering practical phases of malleable founding, cast iron founding and sand control. The malleable shop course, first to be held on that phase of foundry practice, will be under the direction of D. I. Dobson, General Malleable Corp., Waukesha, Wis.

Steel division sessions in prospect appear to be of unusual interest, with committee reports on the status of radiographic examination, coupon tests, heat treatment and methods of producing steel. These are supplemented by comprehensive papers on sand control in steel foundries, steel castings design, effects of aluminum additions and ductility values as affected by annealing.

The most extensive series of malleable papers will cover annealing investigations, atmospheric control, short cycle malleable and pearlitic malleable irons. A number of nonferrous papers discuss silicon in nonferrous castings, heat treatment, gates and risers and age hardening. A committee report will present an analysis of defects.

Gray iron sessions have in prospect papers on foundry practice for production of castings for enameling, relation of microstructure to enameling, research developments on graphitization, heavy section castings of high strength, cupola practice and gates and risers. The exchange paper of the Institute of British Foundrymen is to be presented by W. J. Rees, head, refractories department, University of Sheffield, Sheffield, England.

Convention committees of (*Please turn to page* 62)

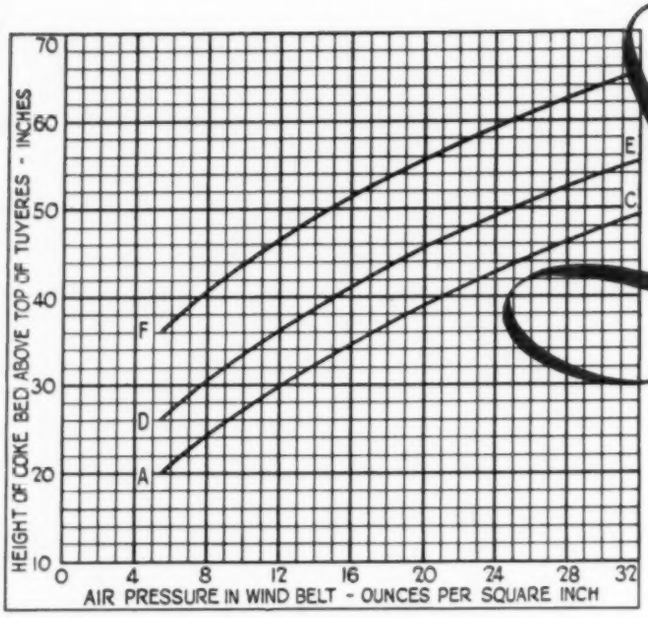


Fig. 1—Height of coke bed required for operation with different air pressures, according to Campbell

Standardize

This article is the first of two from a paper prepared by the author for the Iowa Regional conference held at the State University of Iowa, Iowa City, Iowa under the joint sponsorship of the Engineering college of the university, the Quad-City chapter of the A.F.A., the Northern Iowa Foundrymen's association, and the American Foundrymen's association. The second article will appear in an early issue—The Editors

OPERATION of the cupola consists essentially of burning fuel (coke) in direct contact with the metal to be melted, superheated and cleaned by the use of fluxing material. The cupola is a continuously melting furnace that is very efficient and economical in operation.

Cycle of operation consists of the following steps: If the cupola has been operated previously, the lining is chipped to remove adhering slag, iron and coke and to obtain a clean refractory surface for repairing. The melting zone, immediately above the tuyeres, is the area where maximum erosion and corrosion of the lining occurs due to the extremely high temperatures to which it is subjected (estimated at from 2900 to over 3100 degrees Fahr.), to the abrasive action of the descending charges and to the erosive action of the slag and molten iron.

Tuyeres and Inlets Cleaned

Tuyeres and inlets from the windbox should be inspected and cleaned of any slag and iron. The tap hole area and slag hole are chipped out and the cupola is ready for repairing. The drop, consisting of the unburned bed coke from the previous heat, slag and iron and chipped out material are hauled away. Suitable scaffolds or tables are put in the cupola and the lining of the well and melting zone repaired with blocks if necessary or with bricks and daubing material made of silica sand and fireclay of a fairly stiff consistency.

Any spots in the lining above the melting zone are also repaired. The aim is to keep the contour of the inside diameter as nearly the same as that of the original lining as possible. The slag hole and tap hole may be rammed in around suitable forms using silica or ganister and a good grade of fireclay or preformed cut or molded blocks may be used with the necessary holes drilled or formed during the molding or pressing operation.

Many operators use a two hole breast block, the upper hole being used only in emergencies when the lower tap hole freezes up. The use of oxygen to burn out frozen tap holes makes the use of the upper hole unnecessary. The bottom doors are next put up and suitably propped with steel shafts of the proper length.

Used molding sand of ordinary temper and fairly high permeability then is dumped into the cupola from the charging door and a ladder lowered into the cupola to permit a man to go into it to make up the bottom, which may range in thickness usually from 4 to 8 inches.

The sand is rammed evenly over the bottom doors, care being taken at crevices to get it uniformly packed throughout. It is sloped from all sides toward the tap hole so that all the melted iron will flow easily to the tap hole during the heat. Pieces of wood are next put in the cupola, in most foundries, to be used to start the fire. In some plants oil or gas burners are inserted through the tuyeres.

Pieces Must Lay Flat

Great care is taken in putting in the wood to see that the first pieces put in on the sand bottom lay flat and do not fall in lengthwise with the possibility of gouging a hole through the bottom. If a length of wood penetrates the sand bottom there is always the chance that molten iron will get through the bottom at this point. When this occurs it may be possible to freeze off the runout with daubing material and proceed with the heat but if the condition is bad enough the bottom may have to be dropped and the heat lost.

After the fire is started and burning well, with the tuyeres open for air draft, bed coke is put in. The amount put in may be about the total amount used on the bed or the amount used may be sufficient to fill the well with coke up to the level of the top of the tuyeres. This first bed coke is burned through to a bright red, preferably with natural

Your Cupola Practice

BY GARNET P. PHILLIPS
International Harvester Co., Chicago

draft but with forced draft if necessary, then the bed is brought up to the correct height with fresh coke.

Height of bed usually is measured from the top of the tuyeres and may be from about 35 to 70 inches depending on blast pressure used and, indirectly, on melting rate, blast volume and velocity. Fig. 1 shows recommended bed heights for different blast pressures, according to Campbell's *Metal Castings*. The upper curve *FG* represents the original bed height before charging starts while the middle curve *DE* represents the upper operating height of the bed and it is about 10 inches below the upper curve.

Coke Frequently Is Larger

Lower curve *AC* represents the lower operating height of the bed. The difference in height of *DE* and *AC* is given as 6 inches which is a generally accepted minimum figure for the correct height of the coke layer between charges. The author prefers a figure of 9 inches as a more practical one since the coke pieces frequently have dimensions over 6 inches and a blanket of coke is desired that is continuous across the cupola. This layer replenishes the burning coke bed and accounts for the variation in height of the bed in a properly operating cupola. We will consider this further when discussing reactions within the cupola.

Alternate charges of metal, fuel and fluxing material then are put in up to the lower level of the charging door. General practice is to use the same weight of metal, fuel and flux charges throughout the heat. At one time it was considered good practice to use an extra large metal charge on the bed — but this merely resulted in burning away some of the bed and resulted in a bed of lower height than wanted or else indicated that a bed of too great height was originally used.

After the cupola is charged up to the charging door the blast is turned on and in a few minutes melting starts. Melting is carried on continuously and likewise the charging operations. The slag formed flows out the slag hole in the rear in a continuous stream, if the metal is allowed to flow continuously, or it may flow out the tap hole with the iron and be separated from the iron in a front slagging spout, an example of which is shown in Fig. 2.

Slag and Iron Are Tapped

When intermittent tapping is employed the flow of slag from the slag hole is also intermittent or at least variable in flow, being at a maximum just before tapping occurs and at a minimum after the well is partially emptied of iron after tapping. Molten iron may be tapped into receiving stationary ladles, mixers or forehearths or it may be tapped directly into transfer or trolley ladles.

Receiving or mixing ladles or forehearths used may be ordinary open ladles but the tendency is to use covered insulated ladles of large capacity to hold two or more melted charges thus conserving heat and mixing the molten iron to average up variations and improve uniformity. Likewise transfer ladles used may be the conventional open ladles but the newer types are covered and insulated to conserve the heat in the metal to facilitate handling and to

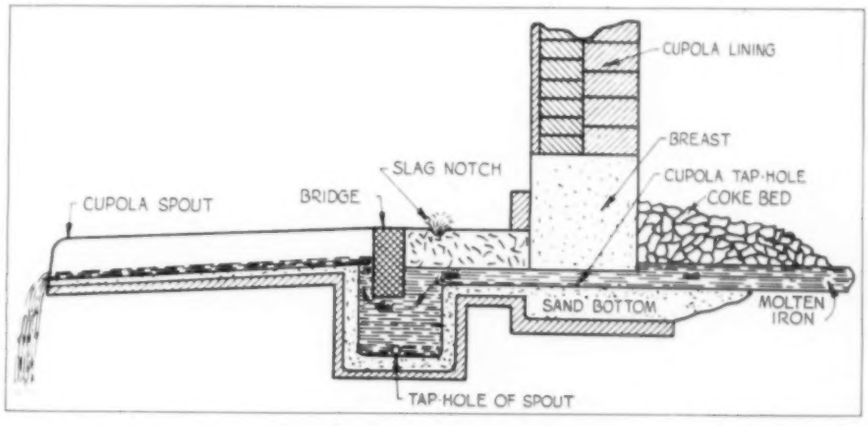


Fig. 2—Cross sectional representation of a slagging cupola spout illustrating the method of operation as the metal is tapped

Table I

Cupola Operating Data

Inside Diameter Inches	Cross-Sectional Area Square Inches	Weight Coke Charges	Weight Metal Charges	Blast Data Cu. Ft. Per Min.	Blast Data Lbs. Per Min.	Melting Rate Tons Per Hour
30	707	100	800	2,070	158	4
36	1,018	140	1,120	2,590	196	5
42	1,385	190	1,520	3,630	277	7
48	1,810	250	2,000	4,670	357	9
54	2,290	320	2,560	5,700	437	11
60	2,828	390	3,120	7,300	558	14
66	3,421	475	3,800	8,820	673	17
72	4,071	565	4,520	10,400	795	20
78	4,778	660	5,280	11,900	910	23
84	5,542	765	6,120	13,900	1,065	27
90	6,362	880	7,040	16,100	1,230	31

Cupola stack gas analysis 16 per cent CO_2 and 8 per cent CO average.
Coke charge 9 inches high. One pound coke occupies 65 cubic inches.
Melting ratio 1 pound coke to 8 pounds iron.
Use 124.5 cubic feet air per pound of coke (includes 5 per cent leakage and 5 per cent excess air).
One cubic foot of air weighs 0.0765-pound under standard conditions of 14.7 pounds per square inch atmospheric pressure and 60 degrees Fahr. temperature.

pour all the metal at a more nearly uniform temperature.

In the operation of the cupola it is necessary to standardize all conditions of operation and to keep all factors as nearly uniform as possible if consistent results are to be obtained. For a given size cupola, operated at a given melting rate to obtain iron at high temperature, it is desirable to use the correct or optimum weights of fuel, metal and flux charges and to supply a constant weight of oxygen to combine with the carbon in the fuel to obtain as nearly perfect combustion conditions as possible.

It is further desirable to use charges that are as small as possible to avoid large variations in the height of the fuel bed. The coke used between charges should form a continuous blanket or layer between successive metal charges. As pieces of by-product coke may be up to 10 inches in a given dimension it has seemed desirable to the author to use a layer of coke 9 inches thick as a standard between charges unless small sized coke is available at all times.

Coke Charge Determined by Weight

For high production automotive foundries the 9-inch height seems best, using regular production foundry coke. For a given sized cupola this will require a definite weight of coke which actually may be determined by weighing the amount of coke necessary to obtain a 9-inch layer of the diameter of the cupola.

If it is desired to calculate this weight an average figure of 65 cubic inches per pound of coke may be used. Good practice in automotive foundries, where iron at maximum high temperature is desired, is to produce 8 pounds of superheated molten iron per pound of coke burned, not including bed coke.

Having ascertained the weight of between-charge coke for a given sized cupola it is only necessary to multiply this weight by 8 to determine the optimum size of metal charge to use. In Table I the author has prepared data for various sized cupolas giving the inside diameter, the cross-sectional area, the weight of coke charges, the weight of metal charges, average melting rate, the blast volume required in cubic feet per minute and the weight of blast or air required in pounds per minute.

The values given are practical, optimum values. The coke and metal charges are correct to the nearest 5 pounds. Frequently operating conditions require or force unavoidable deviations from these values but we find them of value for reference. It will be well at this point to discuss the considerations by which we arrive at the correct volume or preferably weight of air required for the best conditions of combustion.

In burning a pound of carbon completely to carbon dioxide, 2.66 pounds of oxygen are required with perfect combustion and 14,550 British thermal units are evolved. A British unit (B.t.u.) is the amount of heat required to raise the temperature of one pound of water one degree Fahr.

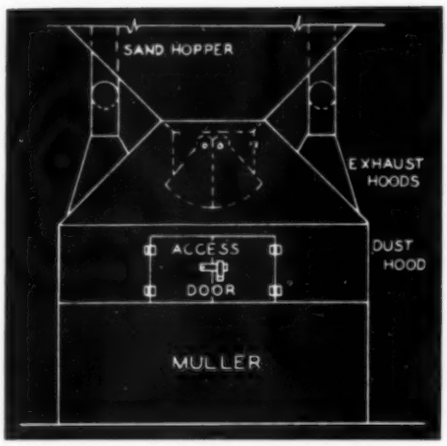
In the cupola this practically occurs at the zone of maximum temperature but the carbon dioxide formed immediately comes into contact with hot coke in passing up the stack and a certain percentage of the carbon dioxide is reduced to carbon monoxide with an absorption of 5850 B.t.u. Any conditions which favor this latter reaction are to be avoided as much as possible but it cannot be prevented as the reaction occurs at a temperature of 710 degrees Fahr. or over.

Analysis of the stack gases at the charging door of the cupola with correct fuel-air ratio should show about 67 per cent carbon dioxide and 33 per cent carbon monoxide when considering these two alone. As there is always about 76 per cent nitrogen present by volume, the actual carbon dioxide content should be about 16 per cent and the carbon monoxide content about 8 per cent or *(Please turn to page 71)*

Table II

Cupola Bed Average Analyses

Initial	No.	CO_2	O_2	CO
A	1	12.0	0.2	14.2
	2	10.3	2.1	14.0
	3	4.5	15.8	0.2
B	1	13.1	0.1	12.4
	2	12.5	0.3	12.9
	2	11.5	8.9	0.5
C	1	11.9	0.1	14.4
	2	12.8	0.1	13.2
	3	15.0	4.9	1.0
D	1	9.8	0.0	18.1
	2	11.5	0.0	15.4
	3	16.9	0.4	4.8
E	1	8.6	0.0	19.9
	2	10.1	0.0	17.1
	3	15.2	0.1	6.8



Exhaust Requirements . . .

For Foundry Dust Control

By JOHN M. KANE
American Air Filter Co., Louisville

NECESSITY for tumbling mill exhaust was recognized early, not only because of the dust generated but primarily due to the retarding effect of the sand in the mill to casting cleaning. Passage for exhaust air was restricted in early designs and required large pressure losses in drawing the necessary volume through the restricted openings in the hollow trunnions.

The exhaust volume is governed usually by the size collar provided at the dust trap of the tumbling mill. A branch duct of the same diameter is used and sufficient air exhausted to maintain a velocity in the pipe of from 4000 to 4500 feet per minute.

In the tumbling cycle, a heavy dust concentration must be handled by the exhaust air when the mill is started. As the tumbling proceeds, the dust concentration gradually becomes less. When the operation is completed, little dust is present in the exhaust air. When mills are loaded with castings having large cores, it sometimes is necessary to use a branch pipe velocity of 5000 feet per minute, to carry the heavy peak dust loads away from the mills.

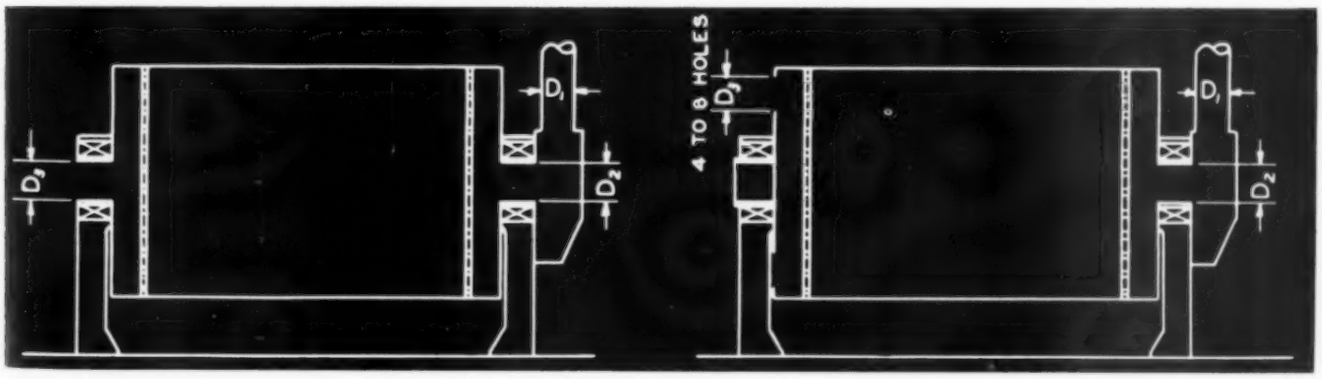
Customary branch pipe diameters are shown in Table VI.

For mills not provided with means of ventilation, enclosures must be provided and exhausted to prevent dust dispersion to the cleaning rooms. Mills must be maintained with joints at loading sections tight to prevent dust escaping.

Pressure drop through a tumbling mill will depend on design of mill and will be a function of restrictions through which exhaust air must be withdrawn. Typical constructions with their losses are shown in Fig. 9. A rough approximation of the hood suction (static suction in the branch connection) can be obtained by adding the velocity pressures of the air (1) in the branch connection (2) in the trunnion at the exhaust end, and (3) at the openings at the far end through which air is drawn from the room into the barrel.

Restrictions caused by the tumbling load will be negligible, and approximately the same volume will be exhausted during the complete tumbling cycle. Blast gates should be provided in the branches and closed at least partially during the loading and unloading period. With the mill covers open, larger volumes will be exhausted from (*Please turn to page* 72)

Fig. 8—(Upper Left)—Dust hood for mullers. Fig. 9 (Below)—Pressure drop for tumbling barrels. The hollow trunnion type is shown at the left and the low pressure design at the right



Stove Shop

ONE of the new gray iron foundries erected and equipped in recent years, the plant of the Marshall Stove Co., Lewisburg, Tenn., incorporates several innovations uncommon to continuous stove foundries. In December, 1936 the old buildings of that company were destroyed by fire, thereby necessitating revision in plans for enlargement of the plant. Plans for a new and larger foundry were prepared immediately and work was started late in January. The design called for a capacity of 100 tons daily, compared with 20 tons for the old plant. Construction was completed in time for the first heat to be poured in July, something of a record in speed of building and equipment installation.

Design Includes Many Unusual Features

The Frank D. Chase organization, Chicago, was responsible for the design and construction of the buildings. Layout of the plant, interior arrangement of the foundry and co-ordinate departments, including design of special equipment and selection of standard equipment, was engineered by the A. A. Wickland Co., Chicago. L. E. Weaver, plant manager, introduced many new methods and radical departures in solving anticipated operating problems.

The plant includes three separate buildings covering a total floor area of 144,000 square feet. The foundry has a large basement with tunnels and runways to accommodate sand conveying equipment and a part of the basement is used for sand storage. A large opening in the floor below each cupola permits disposal of slag and cupola drop directly into the basement. This and other refuse material is collected in the basement and used for fill on adjoining property.

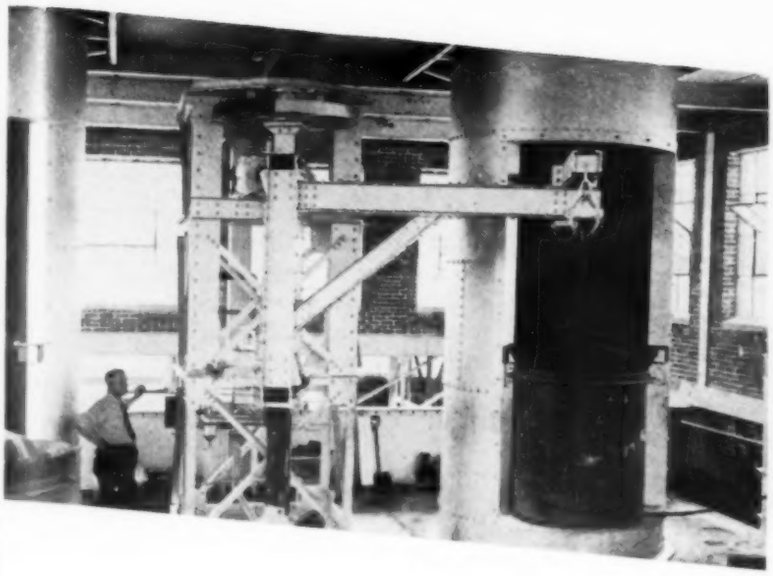
Cleaning room, assembling department and warehouse are located in a separate building and provisions are made for the extension of all buildings without the slightest interference with production. The foundry building has side wall sash extending from the curtain wall to the roof. The roof is provided with a large *A*-frame having two runs of top hung sash to insure abundant daylight and natural ventilation. The interior of the foundry, as well as the mechanical equipment, are painted with aluminum which amplifies the natural daylight, and gives the interior a most pleasing appearance.

Installation of a yard crane, equipped with magnet and clam shell bucket, is contemplated in the future and building columns extend above the roof to receive the future crane runway. When this improvement is completed, concrete bins will be constructed adjoining the present scale house for convenient loading with the crane magnet. These bins extend inside the scale house. An overhead crane with a small magnet will be used for transporting the melting stock from the bins to the scale, thence to the charging buckets. This system of making up the charges shown in dotted lines, lower right Fig. 7 is used successfully in other foundries of similar size and capacity.

The new foundry has 33,000 square feet of floor space, 33 per cent larger than the old foundry but deriving its greatest increase in capacity from the continuous process employed for molding and pouring.

Metal is melted in two 84-inch diameter cupolas.

Fig. 1 (Upper Left)—Catching-in at the insulated transport ladle with hand shanks for pouring. Fig. 2 (Upper Right)—View along the molding line showing the location of the sand hoppers above each machine

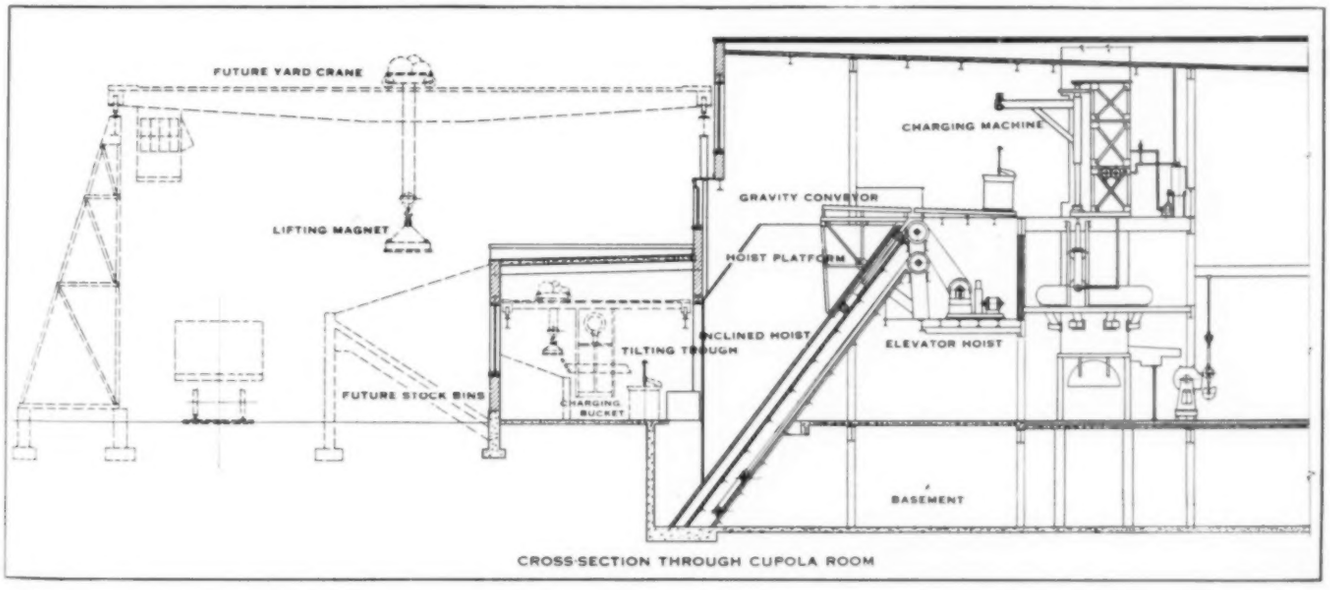


Is Equipped Mechanically

Blast is supplied by a centrifugal blower located on the balcony floor and the volume of the blast is controlled automatically. One charging machine, shown in Fig. 3 serves both cupolas, and requires only one operator on the charging floor. When the charging buckets have been raised to the floor and picked up by the hoist, the boom may be swung to either cupola. The inclined hoist is operated by remote control and the operator on the ground floor can start or stop the motor controlling the lift of the loaded hoist platform. Return of the hoist platform with empty buckets is controlled entirely by the operator on the charging floor. Drop bottom buckets of conventional design, holding 2000 pounds of melting stock, are used. Coke is handled in a similar manner.

The sand preparation system conditions and conveys 90 tons an hour. Because of the frequent turnover of the sand supply and the warm weather often encountered, it was necessary to devise some means of keeping the sand sufficiently cool so as not to interfere with its molding properties. This was accomplished by moving the sand on long, slow moving belt conveyors from the shake-out to a sand storage bin holding 130 tons. From this bin, the sand is carried on an apron feeder discharging a constant volume into a bucket elevator which, in

Fig. 3 (Upper Left)—One charging machine centrally located serves both cupolas. Fig. 4 (Upper Right)—Another view down the molding line giving a better general idea of the layout. Fig. 5 (Below)—Cross section through cupola room



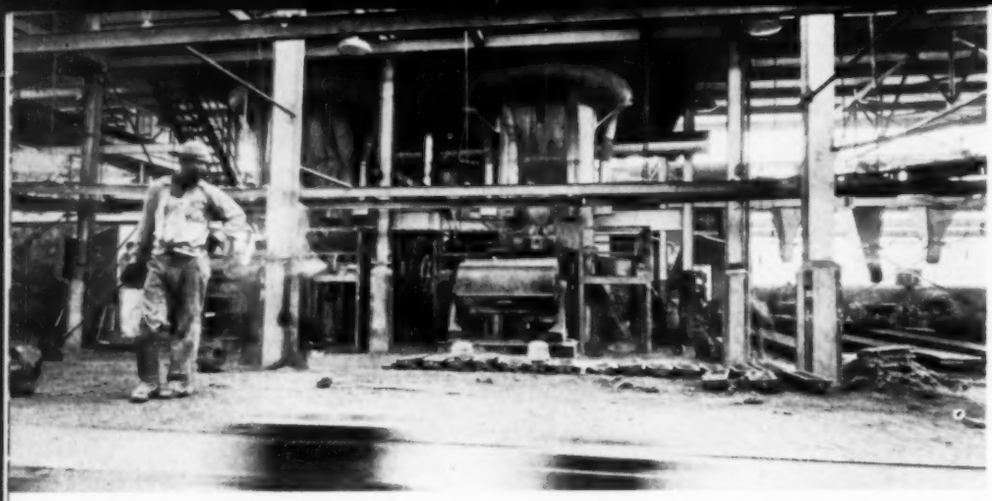


Fig. 6 (Left)—Directly in front of each cupola spout is a 3500-pound capacity, insulated, receiving ladle. Front slagging spouts also are employed

turn, discharges the sand over a vibrating screen. From the screen, the sand is conveyed on an inclined tempering belt where a fine water spray is applied. The tempered sand is discharged into a special type paddle machine for preliminary mixing. An inclined belt carries the sand from the paddle mixer to a continuous muller and aerator. The operator stationed on a platform located between the tempering belt and a belt leading to the continuous muller can sample the sand conveniently and, at the same time, oversee the sand conditioning equipment. Close control of the moisture content is obtained with a daily variation not over 0.4 per cent.

Conditioned sand is conveyed on belts and diverted by manually operated plows to overhead hoppers serving the machine molders. Through special design of hopper and release gate, the molder withdraws the required amount of sand quickly and accurately. Efficient operation of the overhead sand hoppers enables the molders to turn out more work with less spillage than formerly. Increase of from 25 to 40 per cent is recorded. A spill sand conveyor and continuous hopper with floor grating serves all snap flask molding machines. All floors are equipped with molding machines. Sixty-five units comprising power squeezers, plain jolt and roll-over machines, are used in turning out a great variety of stove plate castings.

Cupolas are equipped with front slagging spouts. A 3500-pound capacity insulated cylindrical receiving ladle is located directly in front of each spout.

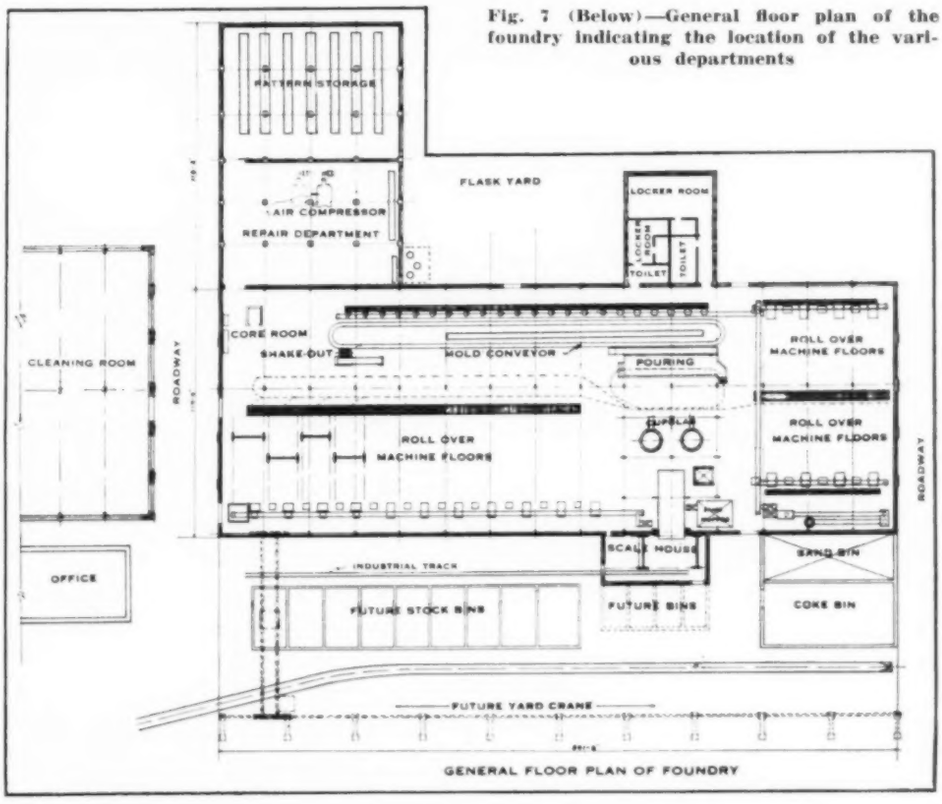


Fig. 7 (Below)—General floor plan of the foundry indicating the location of the various departments

The metal runs continuously and the slag is discharged directly through a floor opening into the basement. Metal is delivered to the floors in cylindrical ladles suspended from an overhead monorail track.

Molds are shaken out continuously and the castings are collected and (*Please turn to page* 77)

Fig. 8 (Left)—Castings are dumped on a vibrating shakeout screen which discharges them onto an apron conveyor, and thence into large tote boxes for cooling

Sound Castings Need Careful Control

By N. K. B. PATCH

GATING and the other steps of molding in the nonferrous field are of great importance in the production of good castings. But after all, if the best mold in the world is filled with metal of inferior quality, the casting only can be a compromise. Therefore, the process of producing the necessary metal is a most important step in the production of perfect castings.

In previous issues of THE FOUNDRY, the author has recommended good practice in the melting of various alloys and pointed out some of the many opportunities for abuse of good metal during the melting period. Sound castings demand metal that is bound to be sound when it is solidified. Metal that has been exposed to gases or improper combustion conditions cannot be sound but must be full of pin holes, of blow holes, gas holes, or the like.

Even though these gas holes are of microscopic size, they still reduce the soundness of the metal. Castings made from such metal may appear good to the naked eye, but when tested in service, either under hydraulic strain or possibly other strains, they may not yield satisfactory results. When castings are to be subjected to tensile strain, as for example, in high pressure valves or cast parts porous metal will not give the best results, even though the alloy when properly made has high strength.

Most of these high strength alloys, such as manganese bronze, aluminum bronze, and the like, must be fed thoroughly to yield maximum strength. Risers must be provided to insure this proper feeding. Their size must be adequate to insure the risers remaining fluid long enough to supply the liquid metal as long as the casting is in need of feeding. The neck joining the riser to the casting must be of sufficient size to remain open during the entire time that the casting requires feeding.

However, if all of these conditions exist and we have metal that has been gassed during melting, all the feeding in the world, the finest quality of mold, the most perfect gating, the most ideal arrangement of chills will not compensate for the gassing of the metal, and the resulting casting will not withstand the tensile strain that the alloy should easily meet were it a sound piece of metal.

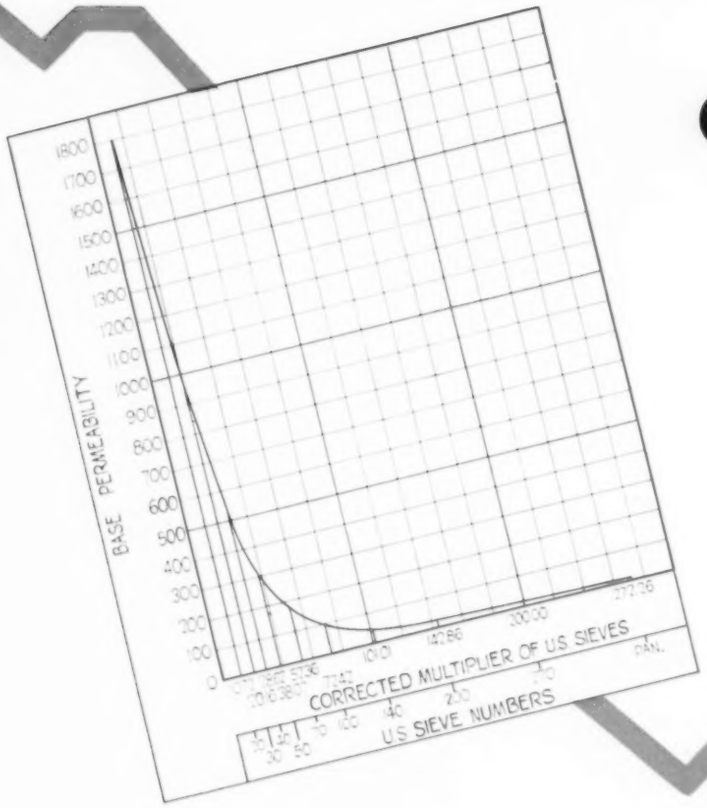
Melting in the foundry is a step demanded so that the metal may flow freely into the different parts of the mold cavity. Melting also has another function in the preparation of the metal for these castings, namely, that of combining the metallic elements into a properly compounded alloy.

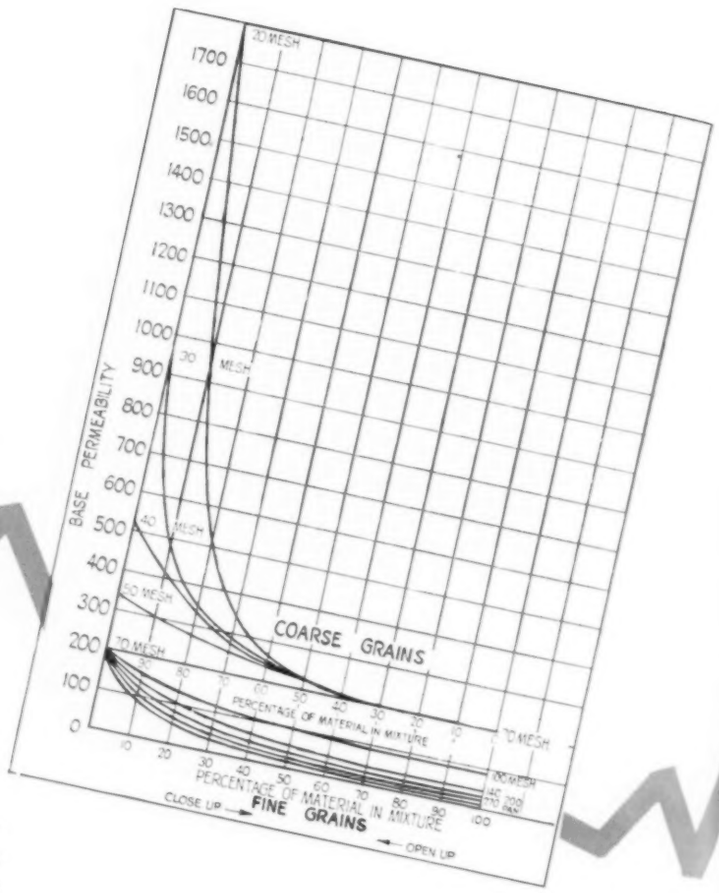
Certain elements in these alloys are more easily vaporized than others and certain of these elements are more easily oxidized than others. In either case these certain elements are reduced in their percentage per portion to the whole by the amount they vaporize or oxidize, as the case may be. Consequently, provision must be made in the process of alloying and melting to compensate for these losses caused by vaporization, oxidation, or both.

Therefore, metallurgical control becomes an important factor and is absolutely necessary if the alloy is to be maintained within rigid limits of modern standard specifications. Each time these alloys are melted or remelted, certain losses of some elements take place. These losses vary with the practice in different melting rooms.

In some foundries melters are so highly skilled that the melting loss is maintained at a minimum. Even more desirable, the melting loss is maintained at a uniform rate so that accurate compensation can be made for that melting loss. In other melting rooms melters are careless and possibly attempting to do many other things as well as melting. Conse- (*Please turn to page* 78)

Controls Molding S





This is the concluding article of two from a paper presented by the author at the New England Regional Foundry conference held at Massachusetts Institute of Technology, Cambridge, Mass. The first article appeared in the January issue

A NUMBER of different methods are used to establish and maintain a rebonding practice in the foundry. These are governed by size of the foundry, equipment on hand, ability to purchase new equipment and type of casting to be made in the sand. Either a high bonding molding sand or clay is used to bind the sand grains. When using either of these, additions should be made gradually and in small amounts to avoid a balling of the clay.

Some plants merely put a small amount of bonding clay on the poured mold before it is shaken out. The bond then is mixed into the heap and the sand tempered at the same time. This method usually is unsatisfactory, particularly if followed for any great length of time. A nonuniform distribution of the bond or any considerable excess of the bond result in a poor surface finish and a greater scrap loss. It is difficult to distribute dry clay evenly over the sand heap so that each grain of sand is coated with the desired amount of clay without forming clay balls.

In some plants the clay is added at the shake-out as the sand passes through a vibrating screen. On close examination we find that clay added in this way tends to produce many lumps in the sand and these must be broken up into smaller particles or removed by screening.

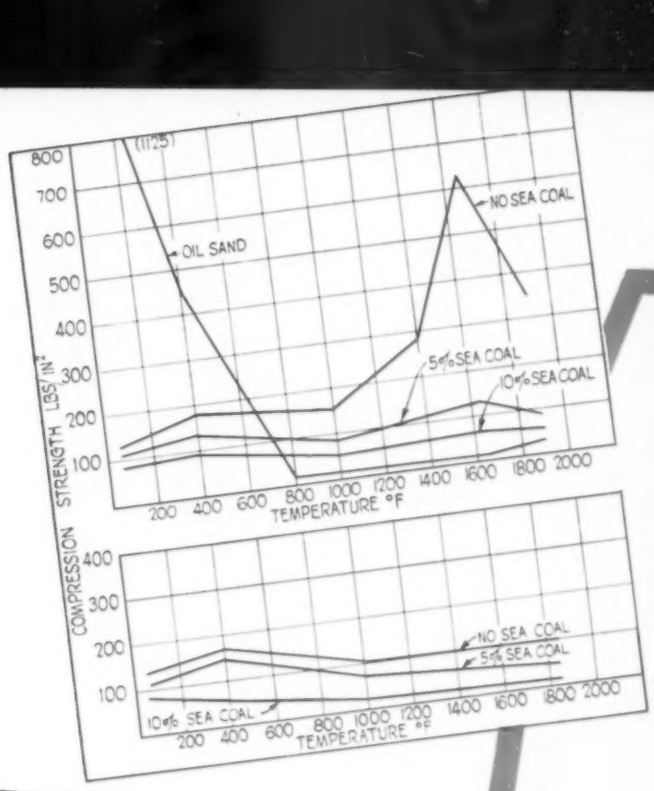
Other shops mull a concentrated mixture of clay bond (2 parts of sand to 1 part of clay) with a small addition of water (not over 2 per cent) and this mixture is distributed over the heaps in the same manner as new sand only in considerably smaller quantities. This helps to distribute the bond more uniformly throughout the heap but the full efficiency is not obtained because the sand grains, except for those mulled with the clay bond, are left merely to contact with the more heavily bonded sand grains. This method is used rather widely and the results are much more favorable than the practice of adding clay to the heap.

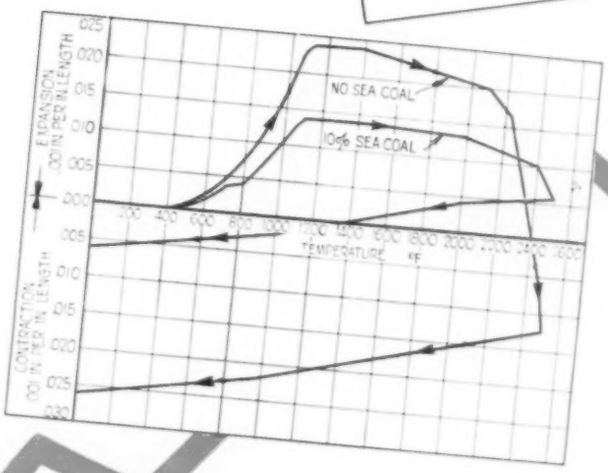
There are some important facts which constantly should be kept in mind by the new user of clay bond or serious difficulties may arise:

1. Clay bond should be added in small amounts. An excessive clay content has a greater tendency to burn on to the casting and produce an inferior surface.
2. A good distribution of clay bond is essential.
3. Employ the A. F. A. tests as much as possible for through their intelligent use molding sand problems and the use of clay bonds will be less

Sand Properties

By WILLIAM G. REICHERT
Metallurgical Engineer
Singer Mfg. Co., Elizabeth, N. J.





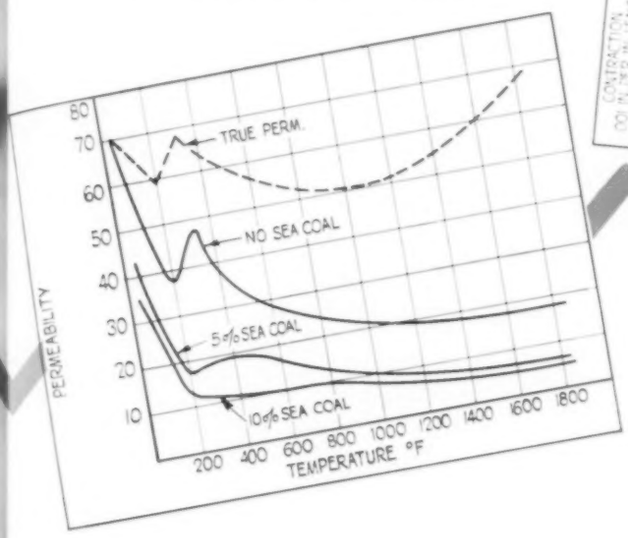


Fig. 1 (Extreme Left)—Base permeability curve of sand grains according to mesh size. Fig. 2 (Left)—Base permeability of sand grains consisting of A. F. A. standard sand and all other sieve sizes. Fig. 3 (Below)—Permeability values of sand at elevated temperatures. Fig. 4 (Right)—Expansion and contraction of sand at elevated temperatures. Fig. 5 (Extreme Right Above)—Compression strength of sand at elevated temperatures. Fig. 6 (Extreme Right Below)—Compression strength of sand after cooling from elevated temperatures

difficult.

A successful sand reclamation program can be had only by the intelligent use of equipment:

1. To properly clean and screen the sand.
2. To control the amount of fines.
3. To prepare and aerate the sand properly.

Method of reclamation will depend upon the type and layout of the foundry and also on whether the fine sand and silt is harmful for the sand requirements. When an increase in permeability is essential the fine material may be removed by a cyclone separator, exhaust fan or a vibrating screen.

It generally is accepted that every sand handling system should be equipped with an exhaust system not only to reduce the maintenance cost on equipment and to prevent dust diseases but also to remove the fines from the sand. In some foundries the very fine grains and silt are eliminated by maintaining a strong suction of air over all shake-out operations or wherever the sand passes from one container to the other. Often dampers are placed in the dust system to regulate properly the removal of fines. If the same amount of fines are removed from day to day, the permeability and strength can be maintained uniformly.

Other systems allow the castings to remain in the sand for a longer time than necessary to dry the sand and later remove the fines by a fan or a blower with large volume and low velocity. If coarse and fine refuse sand are mixed and it is desirable to separate them into two grades, the separation generally is accomplished by sieving in a double deck vibrating screen.

We often find that the production heaps close up rapidly and sometimes are difficult to open. Grain distribution is the important factor and it is essential that every foundryman know the basic method for increasing or decreasing the permeability of his production heaps.

To obtain a clear conception of the permeability power of the grain distribution it is necessary to use base permeability results. In this way variations caused by moisture or clay (*Please turn to page* 80)

QUESTIONS and ANSWERS

This department includes problems relating to metallurgical, melting and molding practice encountered in making castings. Questions from subscribers addressed to the Editor of The Foundry will be answered by members of the editorial staff, supplemented where occasion requires by the advisory staff.

Desires Continuous Melting in Small Diameter Cupola

We have two cupolas with shell diameters of 35 and 47 inches. Each cupola is equipped with a forehearth. We are contemplating a change in foundry operation that will involve continuous operation of the cupola. Melting periods will extend from 7 to 11 a. m., and from 12:30 to 5 p. m. At present we are melting 10,000 kilos (22,000 pounds) per day. We expect to increase this to 15,000 kilos (33,000 pounds) per day. We find that the refractory lining, especially in the smaller cupola burns out excessively after about 4 hours operation. Charge for the smaller cupola is 250 kilos (550 pounds) iron with coke in the proportion of 1 to 10.1. Melting rate for this cupola is 2500 kilos (5500 pounds) per hour. We shall appreciate your opinion on the best method of adapting our melting equipment to meet anticipated requirements.

Several alternative methods suggest themselves to meet the changed conditions under which you propose to operate in the future. The fundamental feature is that you require a continuous supply of iron over a period of 8½ hours, or at the rate of 1176 kilos (2600 pounds) per hour under present conditions and at the rate of 1765 kilos (3900 pounds) per hour at a later period when your output reaches 15,000 kilos (33,000 pounds) per day.

A cupola lined to 19 inches will melt approximately 2600 pounds per hour, while a cupola lined to 22 inches will melt approximately 3900 pounds per hour. Obviously the first step in your program is to line your cupolas down to the indicated size and try a few experimental heats to gage the exact melting speed. According to one plan you might operate No. 1 and No. 2 cupolas on alternate days. However, instead of banking the cupola at noon with a full charge, it may be more advantageous to drain the cupola at 11 a.m. and leave nothing in but the bed coke.

Readjust the bed about 1 p.m., charge the cupola to the door and continue as usual. Small cupolas are more temperamental than large cupolas and usually create a lot of trouble where steady operation is interrupted. Since your refractory lining does not stand up any too well, you may find it advisable to run both cupolas each day. Operate one in the forenoon and the other in the afternoon. The charge for the 19-inch diameter cupola should weigh approximately 180 kilos (400 pounds) and should be broken into small pieces. Your present blower must be adjusted or replaced to supply approximately 550 cubic feet of air per minute.

Composition of Malleable Iron Is Not So Important

We have been asked to manufacture ammonia valves, but are not certain as to what analysis of metal to use. We melt our malleable iron in a 15 cwt. capacity, rotary-type, oil fired furnace, but as the valves have to withstand up to 300 pounds pressure, with ammonia, we find that our castings are not quite tight enough to stand that pressure. Therefore, we will appreciate the correct analysis that would do the job.

It is likely that tightness of the ammonia valve castings is largely dependent upon foundry practice rather than upon the exact chemical composition of the iron. Most pressure castings are made from cupola iron with a carbon content of probably at least 2.80 per cent. On the other hand, manufacturers of iron containing around 2.20 per cent carbon claim to produce perfectly pressure tight castings.

During the World war, enormous numbers of Stokes shells tested under a water pressure of 1400 pounds per square inch were made of malleable cast iron with a carbon content of about 2.40 per cent. Therefore, it is suggested that you look carefully toward your methods of feeding, toward the quality of your sand in the direction of permeability, rather than rely upon any particular analysis. There seems to be

plenty of evidence that those having skill in the art, can produce tight castings of approximately any composition which will make good malleable cast iron. The fact that the pipe fittings business has gravitated toward cupola methods, would suggest that experience has shown that such practice and the resulting compositions have commercial merit.

Relief of Casting Strain May Eliminate Trouble

A question has arisen relative to growth of our diesel engine pistons at the temperatures from 600 to 800 degrees Fahr. That growth causes some of them to seize in the liners when operating at full load. The pistons are cast from a 35 per cent steel mixture and the analysis is as follows: Silicon, 1.36 per cent; sulphur, 0.80 per cent; phosphorus, 0.15 per cent; manganese, 0.89 per cent; total carbon, 3.10 per cent; nickel, 0.50 per cent; and chromium, 0.25 per cent. The pistons include heavy and light sections weighing about 550 pounds, are 31 inches long, and 14½ inches in diameter. They are cast upright in a dry sand mold. The procedure in machining is to rough turn, place in an oven and normalize at about 650 degrees Fahr., permit to cool, and then finish. Our engineer thinks that the steel content is too high and causes the trouble, but with the heavy sections involved it is almost impossible to obtain sound metal in those portions. Do you think there would be any great difference between a 35 per cent and a 10 per cent steel mix so far as a condition of that kind is concerned? Can you give us any information relative to mixtures and analyses which would be suitable for the service involved?

Ordinarily we would expect no trouble with your diesel engine pistons since the composition you are employing should be satisfactory. That opinion also seems to be borne out by the statement that you only encounter trouble with a few pistons, and we believe that the difficulty may result from some other cause. You mention that in machining your procedure is to rough turn the pistons and then normalize at about 650 degrees Fahr. It occurs to us that possibly you may have some casting strains, and we believe that for successful relief, the temperature should be between 900 and 1000 degrees Fahr. followed by slow cooling, preferably in the furnace.

That temperature range is the one usually employed for so-called quick ageing for relief from internal strains. You will note, also, that the suggested range is slightly above that mentioned for the usual operating range of the piston, namely, 600 to 800 degrees Fahr., and as you can imagine will be much more satisfactory for the purpose than the 650-degrees Fahr. treatment you now use. The results indicate that little loss in strength, hardness, etc., will be encountered as long as the heat treating temperature is maintained below 1000 degrees Fahr., say preferably about 900 degrees Fahr. Ordinarily, the length of time the casting is subjected to the required temperature will depend upon several factors, but usually it is one hour for every inch of thickness of the heaviest section.

Relative to your question of the difference between a 35-per cent and a 10-per cent steel mix in relation to growth — we believe that there should be little if any difference provided the final composition is such that a sound casting with a dense, fine-grain structure results. If a coarse-grain, open structure results with either of the mixes mentioned, such iron will tend to show a greater growth proclivity.

Compositions employed for diesel engine pistons include the following: Weight range from 250 to 400 pounds, ⅝-inch to 2-inch section—silicon, 1.50 to 1.60 per cent; total carbon, 2.90 to 3.10 per cent; phosphorus, 0.25 to 0.30 per cent; manganese, 0.45 to 0.55 per cent; nickel, 1.00 to 1.50 per cent; and chromium, 0.30 to 0.50 per cent. Weight, 500 pounds, ½ to 2½-inch section—silicon, 1.55 to 1.70 per cent; total carbon, 3.15 to 3.30 per cent; phosphorus, 0.10 to 0.15 per cent; manganese, 0.75 to 0.90 per cent; nickel, 0.10 per cent; molybdenum, 0.40 to 0.45; and titanium, 0.05 to 0.08 per cent. Silicon, 2.00 per cent; manganese, 0.70 per cent; total carbon, 3.20 per cent; chromium, 0.55 per cent, and molybdenum, 0.90 per cent.

Has Difficulty In Producing Aluminum Alloy Castings

Under separate cover we are forwarding to you two aluminum castings which show spotty at the gate, and also a drawing of the patterns gated and placed on a matchplate. These castings are cast in sand according to A. F. A. grain class I, clay content F, moisture content 5½ per cent and poured at 1500 degrees Fahr.

Examination of the castings submitted which are in the form of channels approximately 4 x 10 inches, 3/16-inch metal thickness in the web and 3/32-inch metal thickness in the legs, shows shrinky sections at the gate farthest from the sprue. The drawing shows that these castings are made three-up in a 12 x 18-inch flask, and it occurs to us that much better results could be obtained by using a slightly smaller flask and making them two-up, thus eliminating a comparatively long flow of metal to the third casting.

No mention is made of the depth of the cope flask, and it is possible that it is not sufficiently deep to provide the necessary head of metal to promote good feeding. Also, we do not have any information on the thickness of the runner which feeds the castings. However, measurement of the gate leading into the casting proper shows a metal thickness of 1/16-inch. The gate should be ⅛-inch thick at that point at least.

The drawing also indicates that the castings are made with the legs down, and while no trouble seems to have arisen from that arrangement, we believe that pouring the castings with the legs up will permit a more quiet entrance of the metal into the legs. Also, we believe that a pouring temperature of 1500 degrees Fahr. is too high, and probably has more to do with your difficulty than anything else. It is suggested that you keep decreasing the temperature until the castings will no longer run properly, and then with that temperature as a base, increase the temperature say 50 degrees, and hold it at that point for pouring.

Hard Iron Required For Grinder Burr

We will appreciate information on a suitable composition for grinder plates for attrition grain grinders.

Grinder plates or burrs for grinding grain must be hard and tough to do work properly. We believe that a composition containing nickel and chromium will give the most satisfactory results. Therefore, the following composition is suggested: 1.00 per cent silicon; 3.25 per cent total carbon; 4.50 per cent nickel, and 1.75 per cent chromium.

Castings made from that alloy should be heat treated at from 1650 to 1700 degrees Fahr. for ½ hour, quenched in oil, and then reheated to 400 degrees Fahr. and cooled in the furnace or in still air. The material cast in sand will have a high hardness and a white fracture. The heat treatment will change the structure to some extent, making it tougher to resist impact, but it will not reduce the original hardness to any great extent.

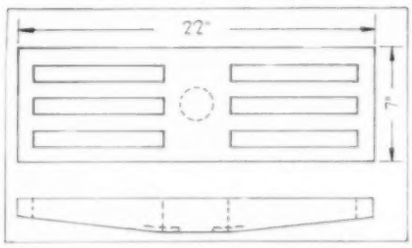
Cores Need To Be Well Vented

We are having considerable trouble with the cores blowing in a gas furnace burner head. We use a local foundry sand. We shall appreciate your advice on a suitable formula for these cores. The accompanying blueprint shows the shape and principal dimensions of the casting.

The cores blow in these castings either from one or a combination of two causes: (A) The core sand mixture is not sufficiently permeable (B) The cores are not sufficiently vented artificially. Cores for these castings should be made from sharp sand exclusively bonded with a minimum amount of oil, say 1 part oil to 50 parts sand, and dried almost to the burning point. An independent vent passage is required in each branch with the vents all converging to the central print.

A suitable opening is required in the green sand print in the mold to allow the vent to escape easily and rapidly. Unfortunately an end view of the casting is not shown, therefore we cannot tell whether the core branches are rectangular, oval, or tapered both ways from the center in cross section. Manner of venting the core depends on this factor. If the branches are rectangular in cross section, so that the core is made complete in one box and turned out on a plate, the core may be vented by placing a long wire in each section, approximately in the center of the branch and extending through a hole in the end of the corebox. A wire also is placed in each end and a larger wire across the center. The transverse wires rest on the longitudinal wires or vice versa.

The only important feature is that they touch each other to form a continuous passage. After the core is rammed, the wires are withdrawn. After the corebox is removed the small openings in the ends and sides of the core are plugged by lightly pinching the sand with the fingers. In the event that the core is round-



Manner of venting cores will depend upon the shape of section of the core branches

ed, or, tapered both ways from the center, a different type of corebox is required. The corebox is made in halves. After the sand is rammed in each half, a plate with suitable narrow projecting members is pressed on the face to form a continuous vent channel on the surface. The two halves of the core then are brought together—*booked* is the shop term—and the top half of the box is removed. It is replaced by a dryer shell. The entire core then is inverted and the second part of the box is removed, leaving the core resting in the shell.

Porosity Is Result Of Poor Melting

We are sending a section cut from one of our bushings with which we are having trouble. The rough bushing is 2¾ x 1 x 12 inches, cast two in a 12 x 18-inch flask. The bushings are molded flat but poured upright. They are gated at the bottom between the bushings with a riser on top of each on the opposite side, with a small gate at the top, sloping uphill so as to feed the head. They are poured at 2050 degrees Fahr. The core used in the bushings is made of two parts of No. 3 molding sand, 1 part white sand, with a cereal compound used as a binder in the proportion of 1 shovelful to a large wheelbarrow load of sand. A proprietary flux is used on the alloy which is comprised of 88 per cent copper, 6½ per cent tin, 4 per cent zinc and 1½ per cent lead.

Examination of the section of the bushing submitted, indicates the main trouble arises from improper melting conditions, since the casting shows numerous fine holes throughout the section. Those fine holes indicate the metal has been permitted to absorb a considerable quantity of gas, which does not have the opportunity to escape during the solidification period.

The remedy is to check melting conditions to see that the metal is melted as rapidly as possible, and as hot as possible, and that the furnace atmosphere is either neutral or slightly oxidizing. If firing with oil, adjust the burners so that less fuel is used. If coke is used, open up the flues so that better combustion is insured.

The method of attaching the risers to the casting does not appeal to us especially in view of the fact that you mention the use of a very small gate from casting to riser. We believe there is a good possibility of the gate freezing before either riser or casting, resulting in no feeding. We suggest extending the bushing so that in the rough it is 15 inches long, cutting off the extra 3 inches in the final casting. If you do not wish to do that, then enlarge the gate between the casting and the riser so that there is no possibility of its freezing before the casting and riser.

Alloy for Steel Mill Bearings

We will appreciate receiving information on the best mixture to use in making steel mill bearings.

While a number of mixtures or alloys are used for rolling mill bearings, the one generally employed for that purpose contains 80 per cent copper, 10 per cent tin, and 10 per cent lead.

Manufacture of steel mill bearings follows the usual practice of molding them with the bearing face down so that a clean surface is obtained. The pattern leaves its own core, and in such cases where dovetails are desired for holding a white metal face, those are formed by use of dry sand cores inserted in slots formed in the green sand cores.

Size and weight are the determining factors on whether skin drying will be required but bearings up to 300 and 400 pounds have been made in green sand. In some cases where a fine smooth face is desired, the core is blacked and is dried. Usually gating is at one end through a single sprue with two branches behind the mold cavity at the bottoms of the legs forming the inverted U. A good sized riser is taken off the top of the U on the opposite side, and sometimes one is taken off at the gate side.

Added Clay Lowers Permeability

Can bentonite be used to increase the bond in stove molding sand. Will the addition of bentonite reduce the permeability, and if so to what extent? Will the continued use of bentonite increase the amount of silt in the sand?

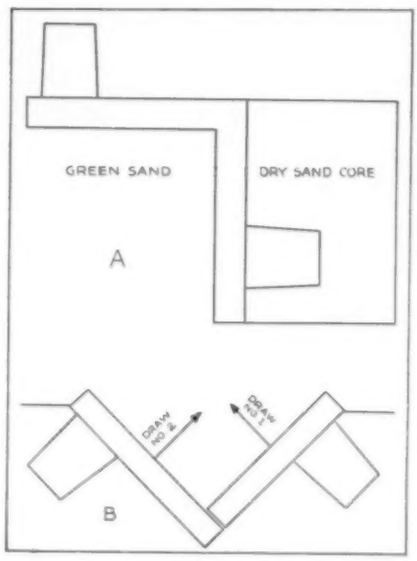
Bentonite or any other clay is primarily a bonding material. Therefore when you ask if bentonite can be used to increase the bond in molding sand, the answer obviously is in the affirmative. For all practical purposes it may be regarded as axiomatic that any increase in the percentage of bonding material means a corresponding decrease in the permeability. Thus, if the original permeability of the sand is considerably higher than actually necessary for any given set of conditions, the bonding element may be raised. On the other hand if the existing permeability is at a minimum for the same set of conditions, any increase in the bond may cause trouble.

Clay bond of any kind must be used with discretion and with a full knowledge of all the involved factors. Where the amount of fines or silts is increased by the use of artificial bond, measures must be adopted to remove this material before it constitutes a menace. To briefly summarize the situation, the addition of clay bond to molding sand is entirely practical, provided the person making the addition is familiar with the characteristics of foundry sand and has the necessary equipment for keeping a close and constant check on the sand from day to day.

Camber Pattern To Offset Warping

We are enclosing drawing of a cast iron louver post 4 inches wide on each side, $\frac{3}{8}$-inch thickness of metal made in various lengths from 9 to 12 feet. On account of the numerous lugs or projections on each of the outside faces, the aluminum pattern is arranged to be molded with one face in the cope and the other or vertical face is formed in a flat dry sand core. The pattern is provided with a wood print for this purpose. Despite changes in gating methods, braces in the mold, stripping the casting, etc., the castings warp.

With your present pattern equipment we do not see you have any alternative but to camber the pattern in the opposite direction to prevent warpage. With a flange all along one side, also one side of the vertical flange in green sand and a dry sand core on the other side as shown at *A* in the accompanying illustration, the side in contact with the green sand starts to contract first and pulls the ends of the casting in that direction. It is a natural law and you cannot stop it. The pattern readily may be cambered by running a number of saw cuts into it, through the metal flange on one side and through the wood core print on the opposite side.



Above—Sectional view of solid pattern with dry sand core print. Below—Sectional view of suggested two-piece all metal pattern

The pattern for this job was not designed properly. It should have been made in two pieces as shown at *B* without any wood print for a dry sand core. The two long strips with bosses attached could be laid on an *A* shaped projection on the follow board with the drag rammed either on a machine or by hand. After the cope was removed, the pattern could be removed from the drag by drawing one section first, then the other at an angle of 45 degrees. If you have a considerable number of the castings to make it might be worth while to make a new pattern according to this method.

Wants Information On Small Cupola

We are thinking of installing a small cupola and will appreciate a list of references to this type of melting unit in former issues of THE FOUNDRY.

Your inquiry leaves us in doubt whether you contemplate construction of the cupola in your own shop, or intend to purchase the cupola from a manufacturer and therefore merely are interested in the method of operating the unit after it is installed. Articles dealing with the construction of small home made cupolas appeared in the April and August, 1933 issues of THE FOUNDRY. In the first instance the shell was composed of a number of cast iron rings molded from pulley rings in the foundry. In the second instance the shell was a pair of discarded oil drums.

In the question and answer section of THE FOUNDRY for May, 1933 and January, 1934, information was presented on the operation of small cupolas, weight of charges, air supply, etc. For a comprehensive treatment of cupola construction and operation we direct your attention to *Melting Iron in the Cupola*, by J. E. Hurst, which may be ordered through THE FOUNDRY. Address of firms which build small and other size cupolas may be found in the advertising pages of THE FOUNDRY.

Cupola Hood Burns Away Too Rapidly

We have trouble with the steel top of our cupola stack which burns out and has to be replaced too frequently. We shall appreciate your advice on this subject.

By the steel top we assume you refer to the hood or conical steel cap supported by three or four upright members above the top of the stack and designed to prevent sparks, smoke and cinders from flying indiscriminately in the vicinity. Usually these hoods last for years, and usually also the upright members fail before the hood. Obviously the remedy in a case of that kind is to provide more substantial supports in the first place. However, if the cap itself burns away too rapidly, the natural inference is that the stack is not high enough.

After the last charge has been placed in the cupola the flame commences to break through and gradually increases in volume until at the close of the heat, with the cupola nearly empty, a full volume of flame shoots up through the stack. Manifestly in a short stack this flame in full intensity plays on the cap. In a high stack the ascending gas has a chance to expand, and combine with the cold air drawn in through the charging door, gradually decreases in temperature. Two alternative methods are open in the present instance. One is to increase the height of the stack by, say, 10 feet. The other is to make a new cap with a flange around the bottom inside and line this cap with fire brick. In this connection, unless local conditions, insurance prohibition, or other factors peremptorily insist on a hood, it may be pertinent to suggest doing away with the hood entirely.

Walton L. Woody

Charles H. McCrea

Henry A. Jensen

Arthur H. Layford

MEN of INDUSTRY

WALTON L. WOODY, former manager, Cleveland works, has been made manager of the Sharon, Pa. works of the National Malleable & Steel Castings Co. CHARLES H. MCCREA, formerly sales manager, has succeeded Mr. Woody as manager of the Cleveland works.

Mr. Woody was born in Terre Haute, Ind., and was graduated from Rose Polytechnic institute with a bachelor of science degree in chemical engineering in 1914. He then became connected with the Indianapolis plant of the National Malleable & Steel Castings Co., and a short time later was transferred to the Toledo plant. He was sent to Cleveland as chemist for the Cleveland works on Dec. 1, 1914, where he continued in various capacities until he was made acting manager on June 1, 1925. Jan. 1, 1926, he was appointed manager, and on Feb. 24 of that year was transferred to the Chicago works where he assumed the duties of manager of that plant. In October he returned to Cleveland and reassumed his duties as manager of the Cleveland works. Mr. Woody is a member of the American Foundrymen's association and a past chairman of the Northeastern Ohio chapter of the A.F.A., and a member of the board of directors. He is a vice president of the Cleveland Safety council, industrial division and has been active in various civic affairs.

Mr. McCrea was born in Logansport, Ind. in 1890 and was graduated from Purdue university with a bachelor of science degree in civil engineering in 1912 and a degree in civil engineering in 1916. After graduation in 1912 until the end of that year, he was connected with the engineering departments of the Pennsylvania and Erie railroads. He then joined the National Malleable & Steel Castings Co., Toledo works as a sales engineer, and in September, 1914 was transferred to the Chicago sales office, where he remained until 1916. From April, 1916 to June, 1917 he was associated with the St. Louis sales office and then resigned to enter military service. During the War he was a captain of the cavalry attached to the 9th division regular army. In January, 1919 he returned to the St. Louis sales office and in May of that year was made district sales manager in the St. Louis territory, remaining in that position until January, 1931 when he was made sales manager of the Cleveland works.

• • •

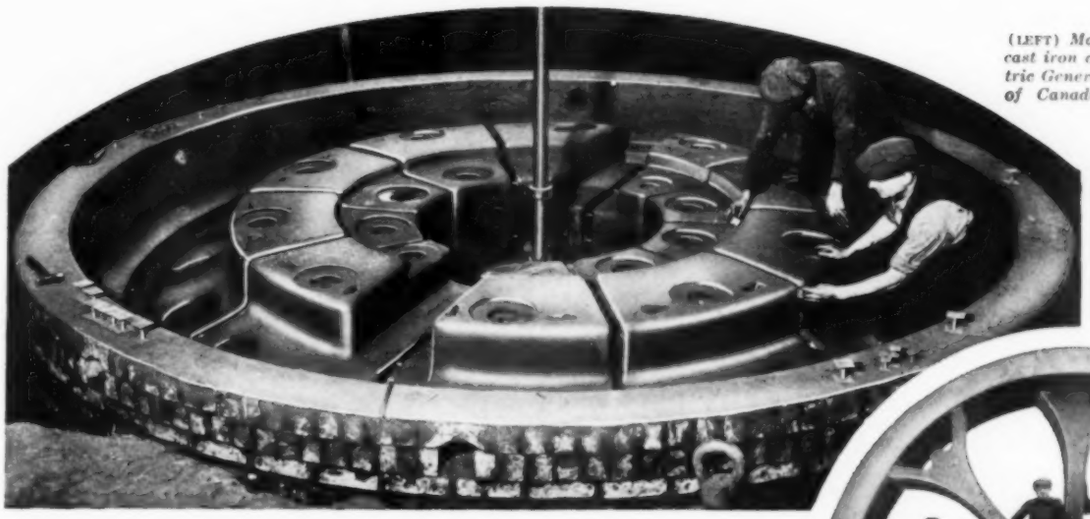
HENRY A. JENSEN, superintendent of the iron foundry General Electric Co., Lynn, Mass., and newly elected president of the New England Foundrymen's association, long has been identified prominently with the foundry industry and with the work of the association. Mr. Jensen finished his apprenticeship as a molder when he was 19, and worked in foundries all over the United States. This experience was supplemented with further study. In 1908 Mr. Jensen equipped and successfully placed in operation the new foundry of the Carbondale Machine Co., Carbondale, Pa. He first worked for the General Electric Co. when in 1911, he was appointed foreman of a new foundry of that company in Erie, Pa. Although he was later employed by the U. S. Brake Shoe Foundry, Corry, Pa., and the Walker Foundry Co., Erie, he returned to the General Electric Co. in 1918 and has remained in its employ since that time. In 1927, he was transferred from the malleable foundry in Erie, where he had been assistant superintendent, to the Lynn Works iron foundry, where he was made superintendent. During the last few years, he has initiated and supervised a modernization program in his plant. Two continuous pouring units have been installed, and many other improvements have been made and suggested for future development.

• • •

ARTHUR H. LAYFORD recently was appointed foreman of the foundry department, National Cash Register Co., Dayton, O. Mr. Layford served his apprenticeship with the Platt Iron Works and the Dayton

(*Continued on page* 44)

BIG CASTINGS AND FOUNDRY BUSINESS



(LEFT) *Making loam mold for Nickel cast iron cover plates of Hydro-Electric Generators at the Toronto plant of Canadian General Electric Co.*

(BELOW) *Giant wheel cast in "Fifty-five" special alloy iron, by the Lake Erie Engineering Corporation of Buffalo, New York.*

...BOTH ARE IMPROVED BY THE USE OF

NICKEL CAST IRON

● In producing high-strength heavy grey iron castings ready machinability must be preserved. In addition, chill at corners must be minimized, porosity in heavy sections eliminated and uniformity in properties and structure of heavy sections preserved. All of these requirements can be met by the use of Nickel. For that reason, the three foundries that produced the castings illustrated, all used a Nickel cast iron composition. Here are the details:

For the Hydro-Electric Generator Cover shown above, the approximate composition of the alloy iron used is:

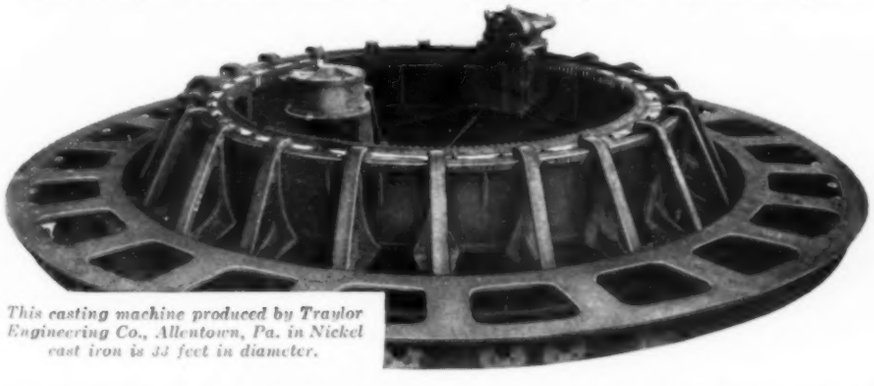
Total carbon	3.30%
Silicon	1.50%
Manganese	0.65%
Nickel	1.20%

The giant Wheel was cast in "Fifty-five" alloy cast iron — which is so named because tensile strength in this special Nickel-molybdenum alloy runs consistently over 55,000 p.s.i. Used for a large variety of heavy grey iron castings for pumps, hydraulic presses, cylinders, gears and other heavy duty applications, this alloy was developed to withstand increased static and dynamic stresses. Composition range and mechanical properties are:

Total Carbon	2.90-3.10%
Silicon	1.40-1.60%
Nickel	1.25-1.50%
Molybdenum	0.40-0.60%
Tensile Strength	55,000-62,000 p.s.i.
Transverse Strength	5,500-6,500 lbs.
Deflection	0.25"

An alloy iron containing about 1½% Nickel was used for the Casting Wheel shown at left.

Nickel when alloyed to iron imparts strength — produces at the same time a close-knit, uniform grain structure throughout varying sections and considerable thicknesses. Consultation on problems involving the application of Nickel to alloy irons is invited.



This casting machine produced by Traylor Engineering Co., Allentown, Pa. in Nickel cast iron is 33 feet in diameter.

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.

(*Continued from page 42*)

Mfg. Co., both of Dayton, and became connected with the National Cash Register Co. in 1913. From that time until his advancement to the head of the department, he served in various capacities.

♦ ♦ ♦

SAM T. KELLER, for many years prominently identified with the automotive sales field, has been appointed district sales manager, Yale & Towne Mfg. Co., Philadelphia division, in charge of the company's

Sam T. Keller

activities in Detroit, Toledo and Grand Rapids areas. Mr. Keller will maintain headquarters at 7310 Woodward avenue, Detroit.

♦ ♦ ♦

DAVID R. WILSON, formerly connected with the Wilson Machine & Foundry Co., Pontiac, Mich., was re-elected president of Willys-Overland Motors Inc., Toledo, O. at its annual meeting held recently.

♦ ♦ ♦

ARTHUR J. O'CONNOR recently retired from service of the Hunt-Spiller Mfg. Corp., Boston. Mr. O'Connor was employed by that organization for approximately 39 years, 25 years of which he held the position of foundry superintendent.

♦ ♦ ♦

JOHN F. CUNNINGHAM, supervisor of production for the General Electric Co., Schenectady, N. Y., since 1931, has been appointed assistant to the vice president in charge of manufacturing, succeeding MYRON F. SIMMONS, who has retired.

♦ ♦ ♦

JOHN F. MCCORMACK, foundry superintendent, Vandergrift, Pa., plant of the United Engineering & Foundry Co., Pittsburgh, since 1923, has been promoted to superintendent in charge of the Vandergrift plant. Prior to joining the United organization in 1907, he was associated with the Youngstown Steel Casting Co., Youngstown, O., and the Duquesne Steel Foundry Co., Coraopolis, Pa.

♦ ♦ ♦

PROFESSOR ENRIQUE TOUCEDA, consulting engineer Malleable Founders society, Albany, N. Y., recently has been elected to honorary membership in the Rensselaer Polytechnic institute chapter of Sigma Xi, national honorary scientific society.

♦ ♦ ♦

CHRISTIAN H. AICHORN, factory superintendent, Dean Brothers Pump Works, 323 West Tenth street, Indianapolis, recently was honored with a surprise party by his fellow employes in celebration of his 50 years of service with the company.

♦ ♦ ♦

JOHN SCHUCH, formerly connected with the United States Radiator Corp., Detroit, as chemist, has become associated with the Harry W. Dietert Co., Detroit, as spectroscopist in the spectrograph laboratory of that company.

♦ ♦ ♦

EARLE A. MANN, for the past several years district sales manager in Chicago for the Standard Brake Shoe & Foundry Co., Memphis, Tenn. and Pine Bluff, Ark., has been appointed director of sales of that organization with headquarters at Pine Bluff.

♦ ♦ ♦

WHEELER MCMILLEN, editorial director of *The Country Home*, and noted agricultural authority, has been elected president of the National Farm Chemurgic council. WILLIAM H. DOW, president, Dow Chemical Co., Midland, Mich., has been made vice president representing industry. The object of the council is to enlarge the income of farmers through finding new markets for the products of the farm.

♦ ♦ ♦

HENRY C. LIMBACH, formerly connected with the Fredericksen Co., Saginaw, Mich., has been made director of sales and engineering for the nonferrous division of the Riverside Foundry & Galvanizing Co., 508 Harrison street, Kalamazoo, Mich. Mr. Limbach also has been connected with the machine tool, automotive and parts industry in the fields of engineering, manufacturing and selling.

♦ ♦ ♦

COLLINS CARTER, for the past several years sales manager, Albion Malleable Iron Co., Albion, Mich., recently has been appointed to the newly-created position of general manager. That action followed a reorganization of the company's executive staff due to the serious illness of B. D. Brown, president. Mr. Carter will continue to supervise sales, assisted by ALFRED SMITH.

RAYMOND H. GARDNER, executive president, becomes acting president and PERCY J. ESLING, assistant secretary, also assumes the duties of treasurer.

♦ ♦ ♦

J. R. WARK, for the past 15 years connected with the E. J. Woodison Co., and for the past 2 years branch manager in the Buffalo territory, has resigned to become associated with the Queen City Sand & Supply

J. R. Wark

Co., Buffalo, handling sales of foundry supplies and equipment. Sales of industrial sands, firestone and other bulk materials will continue under the supervision of J. R. TURNER. Mr. Wark has been active in foundry groups and is the secretary of the Buffalo chapter of the American Foundrymen's association.

♦ ♦ ♦

ELMER A. GULLBERG, general foundry supervisor, Deere & Co., since 1935, recently has been appointed plant manager of the John Deere Harvester Works, in charge of factory operations and purchases. Mr. Gullberg became connected with Deere & Co. in 1904 while still a high school student. He began to work steadily in 1907 at the plow works of that organization and then enrolled at the University of Michigan, continuing to work part time at the plow works. In June, 1910, he was transferred to the Union Malleable Iron Works where he served successively until June, 1924, as cost clerk, production clerk, piecerate man, foundry foreman and general superintendent. He resigned in 1924 to join the Columbus Malleable Iron Co., Columbus, O., as assistant manager and in 1927 returned to the Union Malleable Iron Works as acting manager. He later was made manager and treasurer of that organization. He became

(*Concluded on page 46*)

The Advantages of TRULINE BINDER

1: *Low initial cost.*

2: *Pulverized to a uniform fineness.*

3: *Does not absorb moisture.*

4: *Makes strong cores that will not warp.*

5: *Makes permeable cores that burn out when metal is poured.*

6: *Helps to eliminate cracks, especially in high-shrinkage castings.*

7: *Helps to produce smooth, strong castings, thus reducing cleaning costs.*

8: *Can be used wherever metals are cast.*

Besides these advantages of Truline Binder* we offer you our services in solving special core problems. We maintain a fully equipped core testing laboratory and are working constantly on problems presented to us by foundries so that they can obtain the best types of Truline cores.

Return the coupon for a sample of Truline, the superior dry binder, and further information.

1913 SERVING INDUSTRY 1938 — 25th Anniversary Year

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Please send further information and sample of Truline Binder.

Name

Company

Street

City **State**

JJ-14

(*Concluded from page 44*)

general foundry supervisor of Deere & Co. in 1935.

• • •

ABBOTT F. RIEHLE has been appointed sales manager of the welder and welding electrode division, Harnischfeger Corp., Milwaukee. A graduate of the University of Pennsylvania, Mr. Riehle for 10 years was in charge of sales and manage-

Abbott F. Riehle

ment, Riehle Brothers Testing Machine Co., Philadelphia, which later was taken over by American Machine & Metals Inc., where he continued in charge of sales.

• • •

A. T. CHANDONNET, secretary of the manufacturing committee, General Electric Co., Schenectady, N. Y., has been made assistant manager of the Elmira Foundry Co., Inc., Elmira, N. Y., an affiliate of the General Electric Co. GILES S. MAXWELL, present supervisor of costs, succeeds Mr. Chandonnet as secretary of the manufacturing committee, and THOMAS D. FOY has been made supervisor of costs. Mr. Chandonnet has been secretary of the manufacturing committee since October, 1935. He is a native of Manchester, N. H., and graduated from Tufts college in 1924 with a bachelor of science degree in civil engineering. Following graduation he entered the employ of the General Electric Co. and subsequently filled positions in the accounting and cost departments. For several years before being named secretary of the manufacturing committee, he served on the staff of the vice president, handling special assignments.

Canadian Cutler-Hammer Ltd., 384 Pape avenue, Toronto, recently has been organized to manufacture motor and generator control products in Canada for the Cutler-Hammer Inc., Milwaukee.

Plan Joint Meeting At Birmingham

The sixth annual joint foundry practice meeting sponsored by the Birmingham section of the American Society of Mechanical Engineers and the Birmingham district chapter of the American Foundrymen's association, will feature a symposium on the "Mechanics of the Cupola and Its Auxiliary Equipment." The sessions will be held Feb. 24-25 at the Hotel Tutwiler, Birmingham. The following program has been scheduled.

Thursday, Feb. 24

9:00 a. m.—Registration, Lobby of Tutwiler hotel.

10:00 a. m.—Technical session, ball room. "The Cupola Furnace"—design, construction and maintenance. Chairman, James L. McVoy, McVoy-Hansman Co.

"Balanced Blast Cupola," by W. L. Roueche Sr., McWane Cast Iron Pipe Co., Birmingham.

"Acipco Hot Blast Cupola," by J. W. Cotlin, American Cast Iron Pipe Co., Birmingham.

"Griffin Hot Blast Cupola," by L. H. Rudesill, Griffin Wheel Co., Chicago.

"Plain Cupola," by Clyde Hagler, Continental Gin Co., Birmingham. These papers will be limited to 10 or 12 minutes and discussion will follow after all have been delivered.

12:30 p. m.—Luncheon, Terrace, Tutwiler hotel.

R. R. Deas Jr., chairman, Birmingham district chapter of A. F. A., presiding.

Guest speaker, H. Bornstein, director, testing and research laboratory, Deere & Co., Moline, Ill., and president, American Foundrymen's association.

2:30 p. m.—Technical session—ball room. "Cupola Charging Equipment." Chairman, Lester N. Shannon, Stockham Pipe Fittings Co., Birmingham.

"Shepherd Charger," by Max Kuniansky, Lynchburg Foundry Co., Lynchburg, Va.

"Whiting Wish-Bone Charger," by A. W. Gregg, Whiting Corp., Harvey, Ill.

"Dump Charger," by Victor Szwed, U. S. Pipe & Foundry Co., Birmingham, Ala.

"Acipco Charger," by Dan Guldberg, American Cast Iron Pipe Co., Birmingham.

"Skip Hoist Charger," by E. B. Bradley, Phillips & Buttorff, Nashville, Tenn.

"Charging by Hand," by Lynn Malloy, Anniston Foundry Co., Anniston, Ala.

All papers will be limited to 10 minutes each, and discussion will follow after all have been delivered.

Friday, Feb. 25

9:00 a. m.—Plant visitation. Chairman, William Oberhelman, Hill & Griffiths Co., Birmingham.

2:00 p. m.—Technical session—ball room. "Cupola Blowing Equipment." Chairman, R. M. Marshall.

"Selection of Cupola Blowing Equipment," by S. D. Moxley, American Cast Iron Pipe Co., Birmingham.

(Manufacturers of all standard blowing equipment have been invited to discuss this subject). Time permitting, there will be a general discussion of all previous papers.

7:00 p. m.—Annual banquet, ball room.

Presiding, George R. Ozley, Alabama By-Products Co., Tarrant, Ala., and chairman, Birmingham section, American Society of Mechanical Engineers.

Toastmaster, John M. Gallalee, Birmingham.

Guest speaker, Spencer McCallie, head master, McCallie School for Boys, Chattanooga.

The following committees have been appointed jointly by the A.F.A. chapter and A. S. M. E. section: *General committee*, R. R. Deas Jr., American Cast Iron Pipe Co. and George R. Ozley, Alabama By-Products Co., chairmen; W. Lee Roueche Sr., McWane Cast Iron Pipe Co., R. C. Harrell, J. E. Getzen and John Buell, Stockham Pipe Fittings Co. *Program committee*, W. O. McMahon, Sloss-Sheffield Steel & Iron Co., and J. E. Getzen, Stockham Pipe Fittings Co., chairmen; J. E. Reynolds, U. S. Pipe & Foundry Co. and R. A. Polglaze, Polglaze & Basenberg Co. *Registration committee*, A. H. White, Stockham Pipe Fittings Co., and R. L. Teague, American Cast Iron Pipe Co., chairmen; C. S. Whittet, National Cast Iron Pipe Co., and Emerson S. Marshall, Birmingham, Ala. *Publicity committee*, Harry Mouat, Whiting Corp., and Joseph W. Eshelman, Eshelman & Patter, chairmen; Biddle Worthington, McWane Cast Iron Pipe Co., and George Bentley, Ingersoll-Rand Co. *Attendance committee*, Tom Benners, T. H. Benners & Co., and J. J. Greagan, Allis-Chalmers Mfg. Co., chairmen; J. A. Woody, American Cast Iron Pipe Co., and C. B. Davis, C. B. Davis Engineering Co. *Entertainment committee*, S. B. Murray, Smokeless Fuel Co., and Neal Dugger, Tennessee Cast Iron Pipe Co., chairmen; Joe Franklin, Central Foundry Co. and Herbert S. Kent, Hays Corp. *Plant visitation committee*, William Oberhelman, Hill & Griffith Co., and J. B. Bell, Birmingham, Ala., chairmen; Fred Brown, Adams, Rowe & Norman Co., and William W. Hamilton, Hardie-Tyne Co.

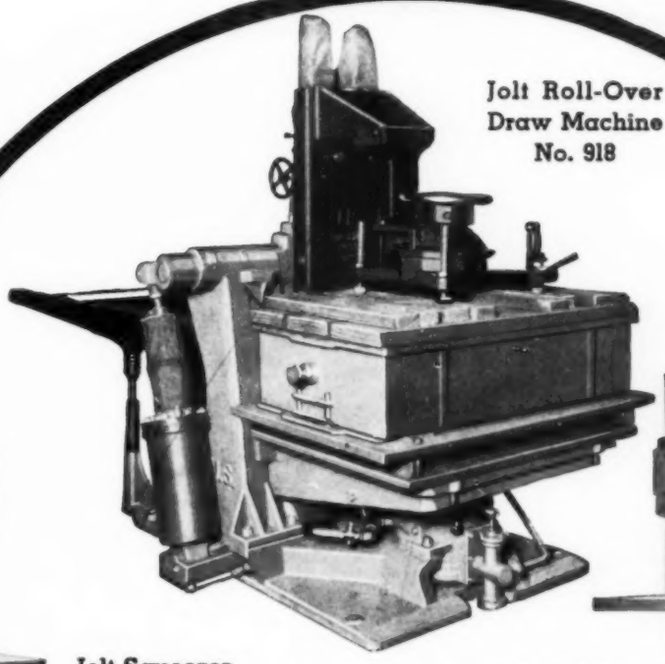
An exhibit of stainless steel has been opened in the New York Museum of Science and Industry, RCA building, Rockefeller center, New York. This exhibit, which is sponsored jointly by Electro Metallurgical Co., unit of the Union Carbide & Carbon Corp., New York, and the museum, portrays the complete story of this interesting alloy. All types of stainless steel castings are on display. These include chemical agitators, cast pipe fittings and pump parts, heat resistant conveyor parts, and decorative castings.

PROFIT BUILDERS

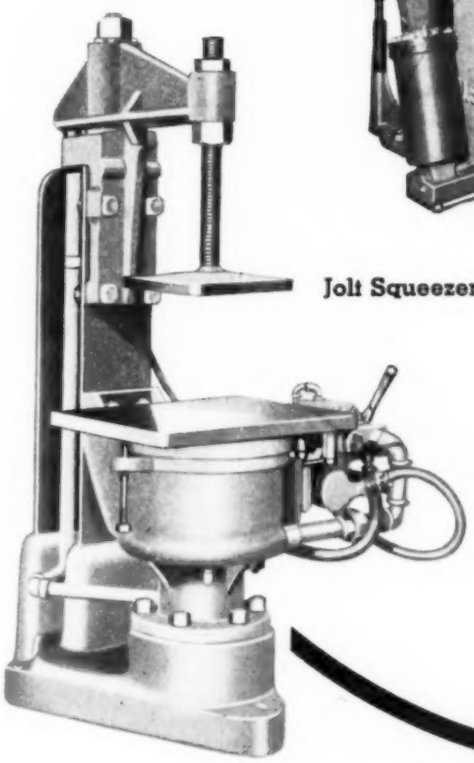
LET "U-S" SHOW YOU

WHAT THEY DO

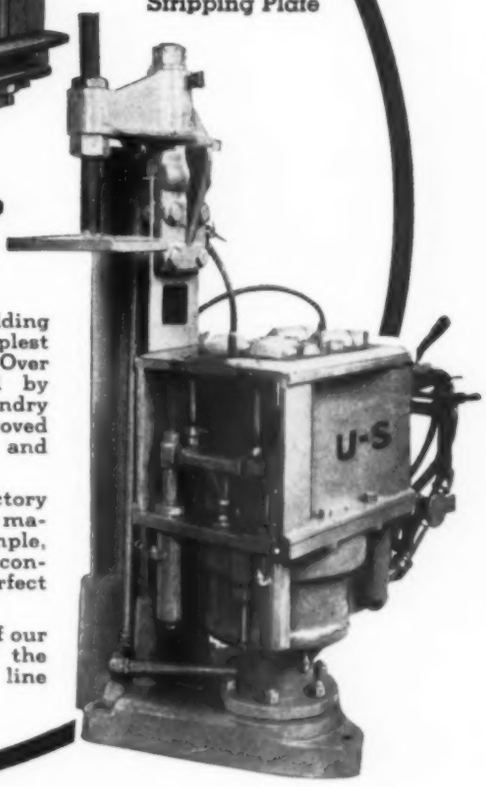
HOW THEY DO IT



Jolt Roll-Over Draw Machine No. 918



Jolt Squeezer



Jolt Squeeze Stripping Plate

A complete line of molding machines from the simplest plain jolt to the Jolt Roll-Over Draw machine—developed by expert and experienced foundry engineers—constantly improved — efficient, dependable and economical.

You can count on satisfactory profit with these molding machines because of their simple, speedy operation and their consistently high record of perfect castings.

Write today for your copy of our new 1938 catalog showing the complete U-S line—the line with the built-in profits.

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CLEVELAND . . . . . OHIO

The worm takes a turn or two

The Adventures of Bill

—by Pat Dwyer

SEEMS to me," Bill said the other night, "you will be kind enough to correct me if I am hopping off on the wrong foot — seems to me that at one time or another I have heard you profess a deep lack of appreciation of certain features presented on the radio."

"Lack of appreciation is good. That is not exactly the term I should apply if I were asked for a written opinion on the subject. In a free for all oral discussion, limit off and no holds barred, I think, in fact I am practically certain I could find at least 47 better and well chosen words. For example—"

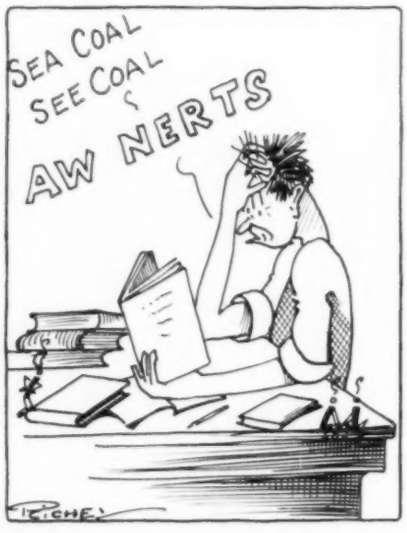
"Not now," Bill interrupted. "Not now. I have a fair working knowledge of the language and although—as you probably have noted—I am a man of few words, I usually aim to use these few words to the best advantage. I sprinkled two or three around kind of promiscuous the other night at a little family seance and as a result I find myself in the dog house. Unconvinced, of course, and unconquered but with the defences all beaten down along the western front."

"This is indeed serious mon General with a capital *G* and with an aksong grauv or an aksong dayguee —I never can remember which— over one of the *e*'s or the last *a*. Would it be indiscreet on my part if I was to ask for a few gory details?"

"Well," said Bill, "I'll tell you. The heavy artillery was brought into action when I ventured to comment on what without doubt is the most inane of all the thousands of compositions sent out by tin pan alley. As a further aggravation the high pressure, breathless announcer assured us that the lovely, colorful lady, world renowned favorite of stage, screen and opera would present the song as a special feature.

Unfortunately my personal acquaintance with the world renowned favorites of the stage, screen and opera is not as complete as it might be. The name was not familiar. I have seen and heard a few favorites and I yield to no person in my admiration for their appearance, their talents and their performance. Give 'em a song and they can sing it as truly and sweetly as the notes on a silver flute, and when necessary as clear, as resonant and ringing, as piercing and nerve tightening as a woman's scream in mortal terror, or the proud challenging notes of the trumpets in the triumphal march from Aida.

"In other words my dear boy, if any other words are needed, these ladies are specialists in an exceedingly limited field. Through study, constant exercise and practice and based of course on a natural gift enjoyed by a comparatively small number of people, these song birds can manipulate their voices over a volume and range far beyond that of the ordinary individual. For this as much as for the pleasure we derive from hearing their glorious voices, we flock to hear them on the screen and stage and gladly tune in when we find that they are scheduled on a radio program."



Maybe the Greeks had a name for it

"Don't tell me. Let me have three guesses. First, the little lady on the program did not quite measure up to your expectations in— shall we say—elongation and tensile strength of the last note. Second—"

"One is enough. She may be easy on the eyes and she may have many commendable qualities. For all I know to the contrary she may have all the physical characteristics of the Venus de Milo, including the two missing arms. I am not interested in any of those features when I sit in front of a radio with ears all properly cocked and ready to hear a flood of melody. In the present instance the voice that came floating out would just about entitle the singer to a place in the back row of a chorus of brightly shining little 8-year olds piping 'Good morning, dear teacher. Good morning to you!'

"When I go to a baseball or football game, a hockey match, a prize fight or a wrestling grunt-and-tangle, I expect to see an exhibition of strength, skill and endurance far in excess of that possessed by the ordinary individual. That is the magnet that draws me and thousands of others to these exhibitions. That is the reason these athletes are given the opportunity to perform and that also is the reason they receive handsome honorariums. The same holds true in practically every field of human endeavor. Certain individuals stand out head and shoulders above the crowd and we gladly acknowledge their suprem-

(*Continued on page* 51)

BORDERLINE PAGES REMOVED

(*Continued from page* 48)

acy. In view of the foregoing why should we tolerate mediocrity on the radio?"

"Are you asking for information, or is that simply a rhetorical gesture?"

"What's the use of asking for information? No person appears to know the answer. That question in a general way sums up the views I expressed after hearing the squeaky mousie performance. Instead of a chorus of approval, a general rally around, shoulder to shoulder and all that kind of stuff, my opinion raised a storm of protest. In a general way I gathered that volume and purity of tone are features of minor importance. Clarity of diction is nonessential so long as three or four words are stressed at intervals. An occasional note half a tone below that of the accompaniment—why, what's a half tone more or less among friends? The song was cute and I was just an old grouch.

"Apparently the only essential feature of a modern song, the feature for which the audience waits in breathless suspense and then breaks out in frenzied applause, is that it shall end on a word which the singer can hold as a single note over five or six bars. The fact that the same feat can be and is performed nightly by every coyote on the western plains, without effort and without price calmly is ignored. In fact if it comes to a show down, an actual contest of intensity and endurance I shall have no hesitancy whatever in placing my two bits on the coyote.

"Singularly enough in this connection it is interesting to note that the modern songsmiths apparently have filched a leaf from our night howling little four footed friend. Sitting on his hunkers, gazing at the moon, his nibs stretches his neck, opens his long mouth, the better to yodel, my dear, and splits the merry welkin with a long drawn out oo-oo-oo! To get the same sound effect, practically every modern song ends up in you, or do, boo, hoo or blue. In the present instance the composer had a real flash of originality. He traveled almost all the way to the end of the alphabet and hit upon the letter *W*. Believe it or not the title of the song and the catch line at the end is 'Let's Pitch a Little Woo'!

"When I ventured the opinion that this represented an all time low, something that even Bacchus would not beat time to on a drum, I was told that the phrase was the latest college nifty, highly approved in all the seats of higher learning, bandied about every campus and regarded as a touchstone by which the real sophisticates recognize each other. Besides, it is cu-u-te and one must keep up with the times, must one not?"

"Well," I admitted cautiously, "while I am with you to the last gasp in your views on certain radio features, I cannot avoid facing the fact that the English language constantly is changing. New words are creeping in all the time and old words over a period of time acquire new meanings, in many instances the direct opposite of the original meanings. For example — present company always excepted—at one time a dummy meant a person without the gift of speech. Today, the term may be and frequently is applied to a person who may be as gabby as a magpie."

"That reminds me," said Bill, "I see where the American Foundrymen's association has appointed a committee to work with an international committee in drawing up or compiling a list of foundry terms eventually to be printed in parallel columns in several languages. A somewhat belated, but nevertheless commendable movement to straighten out a tangle which had its inception at the building of the tower of Babel. The committee is going to have its hands full in trying to explain the meaning of some of our foundry terms to the foreign brothers. For example why is coal dust known as sea coal?"

"The generally accepted explanation—"

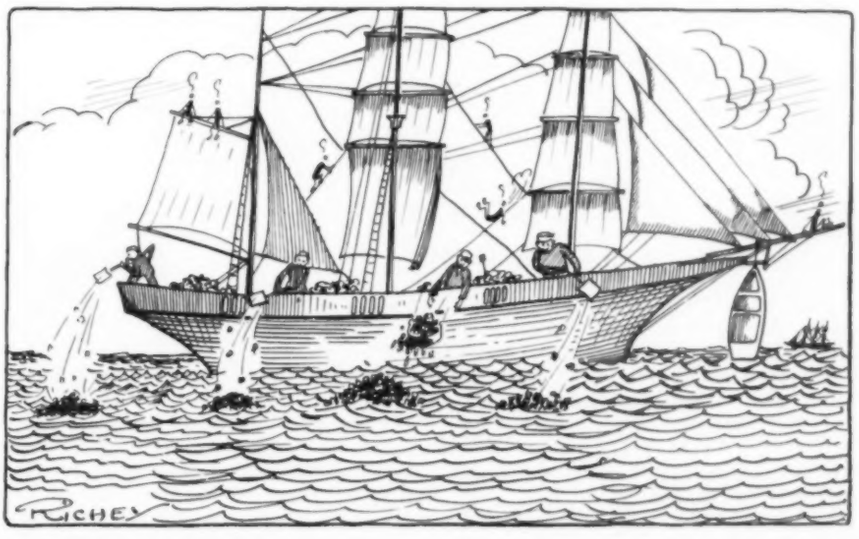
"I have heard and read the generally accepted explanation, but I never have been convinced of its accuracy. Sounds to me more like a shot in the dark by some nimble witted lad temporarily pushed into a corner. After the standardized method set up by the radio boys let us dramatize the little scene at the noon time session around the foundry stove. Time: 1881. Place: foundry of Boom & Buster. Horses Shod While You Wait. Curtain. Music. Every program must have music.

" 'Say, Gaffer. About this here now stuff we mix with the facing sand. Why is it called sea coal?' Confused murmur of voices in the background, Oh, for the loveamike! Pipe down! Then the oracle comes to bat in a deep bass voice.

" 'Well sir, I'm glad you brought that up. As you probably have noted the material is a finely ground, high volatile, bituminous coal. Ahem. The term sea coal came to this country from England in early colonial times and has persisted down to the present. In the preparation of facing sand some enterprising British foundryman discovered that coal from a particular seam gave the most satisfactory results. This seam was near the coast in Wales and extended under the sea. The name sea coal was adopted to differentiate this coal from the product of other workings. In the early days of American foundry practice, coal was imported from England to mix with the facing sand. This probably also was a factor in perpetuating the name, even though domestic coal long since has displaced foreign importations. In some places the material is known as coal dust or mineral facing.'

"There y'are," said Bill. "Fairly bursting with this precious gob of information the inquirer and other listeners retailed the news to any person who cared to listen. Through the rambling habits of molders the story spread from one place to another. Since it is much easier to accept a statement than it is to hunt up proof for a reasonable challenge the explanation always has been accepted. Of course the majority of foundrymen neither know nor care where or how the name originated. In their estimation a rose by any other name still smells like a rose. So long as the coal does the work

(*Concluded on page* 74)



From a rare old print: Unloading Coal at High Tide, Boston Harbor 1773

VIEWING FOUNDRY DEVELOPMENTS AT SHORT RANGE

A SAND cast nickel bronze which is heat treated to obtain high physical properties contains 88 per cent copper, 5 per cent tin, 5 per cent nickel, 1.75 per cent zinc, and 0.25 per cent manganese. It is heat treated at 1400 degrees Fahr. for 10 hours, water quenched, reheated to 500 degrees Fahr. for 5 hours, and water quenched. Tensile strength after treatment is given as approximately 74,000 pounds per square inch, elongation as 17 per cent, and brinell hardness number as 136.

* * *

An aluminum alloy containing 10 per cent copper; 1.2 per cent iron; 4 per cent silicon, and remainder aluminum is claimed to be particularly applicable for parts such as flat iron sole plates where maximum hardness at operating temperatures is desired. The alloy is designed for permanent mold castings.

* * *

One of the leading automobile manufacturers employs scrap high speed steel for the base of its cast steel valve seat inserts. The final composition contains 1.2 *to* 1.4 *per cent carbon,* 0.30 *to* 0.50 *per cent manganese,* 2.50 *to* 3.50 *per cent chromium,* 0.30 *to* 0.60 *per cent silicon,* 1.50 *to* 2.00 *per cent copper, and* 14.0 *to* 17.0 *per cent tungsten.*

* * *

A refractory mortar or plastic material should possess the following qualities: Sufficient refractoriness to withstand the prevailing temperatures; reasonable resistance to slags or chemical action to which it is subjected; necessary plasticity to permit proper application; bonding qualities at temperatures to which it is subjected; resistance to thermal shock when required; lack of shrinkage in use except when it may be used as an expansion joint material.

* * *

TOWERS of a recently completed ore handling bridge are mounted on turntables. Each turntable assembly consists of two cast steel bearing castings 15 feet long planed top and bottom for roller bearing. They are firmly braced and the assembly held in place by a bronze bushed steel casting placed over a 7½-inch diameter pin which is connected to the truck girders below.

* * *

Grids for a rotating abrasive blast table made from an alloy cast iron containing about 14 per cent nickel, 7 per cent copper and 2 per cent chromium showed hardly any appreciable wear after 116 days operation.

* * *

A popular nonferrous alloy for ornamental castings contains 88 per cent copper; 2 per cent nickel; 2 per cent tin; 2 per cent lead, and 6 per cent zinc. Lead is kept as low as possible without impairing machinability as high lead is detrimental to the making of beautiful oxidized finishes.

* * *

Cast scrap should be examined carefully to prevent tramp metals such as brass, bronze or babbitt from entering the charge for the melting furnace, and burnt iron such as used grate bars and heavily oxidized scrap should be avoided studiously. Alloy contamination of scrap sometimes causes trouble, and unoxidized scrap castings should be looked upon with suspicion as they may contain high chromium, nickel or silicon.

* * *

An excellent alloy for bearings operated at high speed and under light or medium pressure contains 70.5 *per cent copper;* 6 *per cent tin;* 20 *per cent lead;* 1 *per cent zinc,* 0.05 *per cent phosphorus, maximum. The alloy possesses a tensile strength from* 22,000 *to* 27,000 *pounds per square inch; and elongation of* 10 *to* 16 *per cent in* 2 *inches; a reduction of area of* 7 *to* 13 *per cent, and a brinell hardness from* 42 *to* 47. *It is not difficult to handle in the foundry, and machines easily.*

* * *

An aluminum-free nitriding steel which may be cast into any desired shape has excellent tensile and impact properties, and provides a tough nitrided case, contains approximately 0.15 per cent carbon, 0.45 per cent manganese, 0.25 per cent silicon, 2.75 per cent chromium, 0.50 per cent molybdenum, and 0.25 per cent vanadium.

* * *

ALUMINUM alloys containing silicon as the hardening agent have excellent casting qualities and can be used in the production of large thin section castings which are intricate in design, or of castings which have adjoining heavy and light sections. They also are employed in the production of castings which must withstand fluid pressures without leaking. Aluminum-silicon alloys have excellent resistance to corrosion, and the most widely used composition is that containing 5 per cent silicon.

Production Machinery—

★*In this Chicago non-ferrous foundry each molder is served by two lines of roller conveyors with lateral slope. Logan bearings in protected position, set back from end of roll. Bearings have all-steel seals for long life, least friction.*

—not simply auxiliary equipment

Not so long ago foundrymen considered conveyors as auxiliary equipment that made "spot" savings here and there in the plant. But today the picture has changed. Well-planned material handling equipment has become such an integral part of foundry operations that it is definitely regarded as basic production machinery.

From molding stations, straight through pouring, to shakeout, and through machining, modern mechanical handling is pointing the way to lower-cost foundry production. Is your foundry as *fully* conveyorized as it could be—for the most profitable returns to you?

Considering the savings in time, effort, space, accurate scheduling, and inventories, it will pay you today as never before, to investigate. The nearest Logan engineer is "on call" to you. Or write, on your letterhead, for Bulletin 15, no obligation.

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ACTIVITIES OF FOUNDRY GROUPS

Metropolitan

FORMATION of a new chapter of the American Foundrymen's association was approved, officers were elected, and a program was planned at an organization meeting of foundrymen in northern New Jersey and eastern New York which was held at the Essex House, Newark, N. J., Jan. 17. More than 60 men attended the dinner, and 75 were at the meeting. The new group, to be known as the Metropolitan chapter, will devote itself to educational activities.

Donald J. Reese, International Nickel Co., Bayonne, N. J., was elected president of the new chapter for the remainder of the year. Other officers elected were W. E. Day Jr., International Motor Co., New Brunswick, N. J., vice president, and T. J. Wood, Robins Conveying Belt Co., Passaic, N. J., secretary-treasurer. As directors, the group chose: R. J. Allen, Worthington Pump & Machinery Corp., Harrison, N. J.; J. W. Reid, Robins Conveying Belt Co., Passaic, N. J.; and Sam Tour, Lucius Pitkin Inc., New York.

Marshall Post, vice president, Birdsboro Steel Foundry & Machine Co., Birdsboro, and vice president of the national association; and Harold Henzey, Carborundum Co., Philadelphia, and president of the Philadelphia chapter, spoke briefly in the interest of the new group.

Hyman Bornstein, director, testing and research laboratories, Deere & Co., Moline, Ill., and president of the American association, served as organizing chairman and was the chief speaker. In his talk, entitled "Cast Iron" Mr. Bornstein described the melting practice in the Deere foundries. Of particular interest to the members of the association was his discussion of briquetting borings and turnings, and his explanation of the use of mixing and covered ladles. Local prices, he said, governed the type of steel and gray iron scrap usually used. Although the use of briquetted borings and turnings did not change the properties of castings, it saved about $2 a ton in the Moline area.

Control of metal for pouring is much easier when chill tests are made constantly on the metal from the cupola spout. Mr. Bornstein said

Donald J. Reese

that by gathering data over a period of time, one may use the chill test to determine whether the metal is suitable for any particular type of castings. When the chill shows the metal is not suitable, additions of either graphite to decrease the chill, or chromium to increase the chill, can be made readily to the ladle.

In the Deere & Co. plant, he said, mixing and covered ladle practice maintains high metal temperatures to molds 750 feet from the cupola. Of particular interest to the group was his description of the treatment of cast iron in the mixing ladles with purite. For more than an hour after his speech, he was kept on the floor by the animated and interested questions and discussion of the members of the new chapter.

The group decided to hold its meetings on the third Monday of each month, and the following programs were announced: Feb. 21, "Non-Ferrous Casting Defects—Their Causes and Cures," by Sam Tour, Lucius Pitkin Inc.; March 21, "Sand Control," by R. F. Harrington, Hunt Spiller Co.; April 18, "Steel Castings," by J. H. Hall, consultant; May 23, "Alloy Cast Iron," by V. A. Crosby, Climax Molybdenum Co.—*Frederick G. Sefing.*

St. Louis

ONE of the most interesting and best attended meetings in many months was held by the St. Louis district chapter of the American Foundrymen's association on Thursday, Jan. 13 at the York hotel, St. Louis. C. A. Barnett, president, Foundry Equipment Co., Cleveland, presented the principal talk on "Foundry Core Baking and Mold Drying." His discussion covered thoroughly the subject of core baking and mold drying. A number of stereopticon slides were shown giving a picture of various charts and many interesting installations of core baking and mold drying equipment throughout the country.

The St. Louis chapter membership has shown a fine co-operative, growing interest in all local and national A. F. A. affairs. Within the past few months a considerable number of members have attended chapter meetings of other groups—a large group attended the regional conference at Iowa City with the general purpose in mind of observing conference handling in order that such information could be used in St. Louis chapter conference work.

The group has an interesting program of activities for the future. The February meeting will be addressed by George A. T. Long, Pickands, Mather & Co., Chicago, on "Cupola Practice."

Of outstanding interest will be a meeting to be held Friday evening, March 25 at Kansas City for the purpose of interesting Kansas City

(*Continued on page* 57)

ACCURATE GRINDING
with Less Wheel Dressing

PRECISION work, such as pump-piston grinding, can be performed with high efficiency by use of Bakelite resinoid bonded wheels. Tough, even-wearing, cool-running and non-gumming, these wheels produce finer finish with less frequent dressing. For *non*-precision work, they permit higher safe speeds: up to 8,500 s. f. p. m. on snagging; up to 16,000 s. f. p. m. on cut-off. Write for booklet 15G, "High Speed Abrasive Wheels".

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FOR ECONOMICAL HIGH SPEED GRINDING

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(*Continued from page* 54)

foundrymen in A. F. A. work and to give them a taste of what the A. F. A. has to offer. Present plans call for a large group to leave St. Louis to be in attendance at that meeting. General plans for the meeting have been worked out by L. Desparois and R. K. Durkan in co-operation with other members and the Chicago office of A. F. A.

Definite plans have been made for the holding of another regional conference under the auspices of the chapter at the Missouri School of Mines and Metallurgy, Rolla, Mo. on Oct. 7 and 8, 1938.—*John W. Kelin, Secretary.*

Quad City

JANUARY meeting of the Quad-City chapter was held Jan. 17 at the Fort Armstrong hotel, Rock Island, Ill., with 100 present. P. T. Bancroft, chapter chairman, was the presiding officer. The next meeting of the group will be a joint meeting with the American Society for Metals at the Rock Island arsenal on Feb. 8.

A. S. Nicholas, vice president, Illinois Clay Products Co., Joliet, Ill., spoke on clay in molding sands. He gave the essential ingredients and properties of both molding sand and clay, and stressed the importance of proper balance in modern foundry specifications. The Tri-City area, he said, not only was one of the world's important foundry centers but also a district that produced and had large quantities of molding sands and clays.

Paul Bechtner, American Colloid Co., Chicago, spoke of clays not found in the Middle West. He explained their composition and peculiar characteristics. He listed the various clays used in synthetic sands. Following his presentation, many questions were asked both speakers about the use of clay bond, and the use of clay for waterproofing and other specialized purposes. —*J. Morgan Johnson.*

Northeastern Ohio

APPROXIMATELY 160 members and guests attended the first 1938 meeting of the Northeastern Ohio Chapter of the American Foundrymen's association held at the Cleveland club, Cleveland, on Jan. 13. After the dinner, over which Bertram G. Parker, Youngstown Foundry & Machine Co., and chairman of the chapter, presided, representatives of 10 foundry equipment manufacturers described new developments and improvements in their firm's products.

The session after the dinner was guided by Arthur J. Tuscany, executive secretary, Foundry Equipment Manufacturers' association, who introduced the speakers. John Booher, advertising manager, Cleveland Tramrail Co., Cleveland, described an installation of his company's materials handling equipment recently made in Elmira, N. Y. A. L. Gardner, advertising manager, Pangborn Corp., Hagerstown, Md., used motion pictures to illustrate his interesting presentation of the speed and performance of new blast cleaning tables and barrels. Leon F. Miller, sales engineer, Osborn Mfg. Co., Cleveland, explained the advantages in using core blowing machines. He illustrated his talk with stereopticon slides of the core machine as well as numerous installations.

A new method of dealing with the dirt and smoke from cupolas was explained by B. A. Smith, engineer, C. O. Bartlett & Snow Co., Cleveland. With lantern slides and pictures he described a recent installation of specially designed equipment which collected the cinders and dust from two cupolas. W. C. Packard, National Engineering Co., Chicago, spoke briefly about the adaptability of Simpson mixers for foundry services, and illustrated with lantern slides several recent improvements in the sand mixing machinery.

"Dust collection" was the subject of two brief speeches. The first was given by John G. Liskow, chief engineer, Claude B. Schneible Co., Chicago, who presented a paper on the construction and uses of the new equipment developed by his company. The second was given by John M. Kane, American Air Filter Co., Louisville, Ky., who explained with charts and pictures the construction of a water spray dynamic precipitator dust collector, first built 18 months ago.

F. A. Ebeling, general sales manager, W. W. Sly Mfg. Co., Cleveland, presented a paper in which he urged foundrymen to give the choice of proper dust control equipment serious and scientific consideration. The problem of dust, he said, was a real challenge to American industry. With motion pictures, F. W. Pedrotty, mechanical engineer, American Foundry Equipment Co., Mishawaka, Ind., explained the construction, operation, and possibilities of his company's blast cleaning tumblers and tables. W. J. Ramsey, sales engineer, Mathews Conveyer Co., Ellwood City, Pa., used drawings and photographs to introduce and explain several new installations of conveying systems.

New England

APPROXIMATELY 200 members and guests attended the annual dinner of the New England Foundrymen's association held at the Engineers' club, Boston, on Jan. 12. In an election held before the dinner, Henry A. Jensen, superintendent,

(*Concluded on page* 60)

H. J. Deutsch
Metallurgist, Aluminum Co. of America, Detroit, and secretary of the Detroit chapter

W. G. Gude
Chicago editor of The Foundry, and secretary of the Chicago chapter

J. Morgan Johnson
Vocational director, Tri-City Manufacturers' association, and secretary-treasurer of The Quad City chapter

W. B. Coleman
President, W. B. Coleman & Co., Philadelphia, and secretary-treasurer of the Philadelphia chapter

THE FOUNDRY

comes

CLEVELAND, the center of the foundry industry, presenting geographically one of the most convenient meeting places for the foundry industry, will again be host to world foundrymen in May when the American Foundrymen's Association stages its 42nd Annual Convention and Exhibit.

CLEVELAND's great Public Auditorium will again open its doors and the entire city will hang out the "Welcome" sign as manufacturers of foundry equipment and supplies collectively display their modern machinery, methods and accessories for the inspection of thousands of visiting foundrymen.

Leaders of the metal casting industry will be there — Executives — Superintendents — Foremen — Molders. They will meet old friends . . . make new friends . . . common problems will be discussed . . . new equipment and supplies will be purchased.

Such is the tangible expression of progress!

THE FOUNDRY looks forward with pleasure to the opportunity of welcoming foundrymen to Cleveland, "hometown" of THE FOUNDRY, whose two Convention issues will herald and record what promises to be a *great convention!*

CLEVELAND AUDITORIUM

•

MAY 14-19, 1938

CONVENTION

home again!

The May, Pre-Convention Issue . . .

■ Previewing the convention in its entirety . . . the line-up of exhibitors . . . schedule of technical sessions, giving the time, place and subjects . . . outline of social functions . . . program of plant visitation . . . focusing the interest, holding the attention of readers the world over. These, in addition to the regular features of any issue of The Foundry, will make the May issue outstanding—truly an advertising opportunity!

The June, Post-Convention Issue . . .

■ Recounting after the visiting foundrymen have gone home . . . after the last box, barrel and crate is re-consigned to its shipper and the 42nd Annual A. F. A. Convention becomes part of the indelible history of the foundry industry, foundrymen will turn to the *Post*-Convention issue of The Foundry. There they know they will find an accurate chronicle of what happened . . . what was said . . . and who were there.

Preserved for all time in the Pre and Post-Convention issues of The Foundry, this great 42nd Annual A. F. A. Convention will become an important leaf in the history of metal casting.

Advertising space reservations in both issues may be made at this time.

THE FOUNDRY

CLEVELAND

COME • LEARN • PROFIT

(*Concluded from page* 57)

of the Lynn Works Iron Foundry, General Electric Co., unanimously was chosen president of the association for the coming year.

Robert J. Nelson, Arcade Malleable Iron Co., Worcester, Mass., was elected vice president. Other officers chosen were Arthur W. Gibby, East Boston, Mass., treasurer, and Ernest F. Stockwell, Barbour-Stockwell Co., Cambridge, Mass., secretary. The executive committee includes Francis LeBarron, E. L. Le Barron Foundry Co., Brockton, Mass.; Charles Butler, Warren Pipe Co., Everett, Mass.; Raymond Meader, Whitin Machine Co., Whitinsville, Mass.; Augustus W. Calder, New England Butt Co., Providence, R. I.; and Charles A. Reed, Rogers-Brown-Lavino Co., Cambridge, Mass.

A social hour which was held before the dinner served to introduce new members and friends to the group. For the program after the dinner, the chapter's committee on arrangements, Mr. Reed and Mr. Jensen, had provided the group with excellent entertainment and music. —*M. A. Hosmer.*

Chicago

HYMAN BORNSTEIN, president of the American Foundrymen's association and director of testing and research laboratories, Deere & Co., Moline, Ill., was the principal speaker at the monthly meeting of the Chicago chapter, held at the Medinah club, Jan. 10. Attendance was about 175. G. P. Phillips, International Harvester Co., was technical chairman.

J. W. Kelin, Federated Metals Corp., St. Louis, addressed a separate technical session of the nonferrous group, presided over by J. D. Burlie, Western Electric Co.

Mr. Bornstein's talk on "General Melting and Metallurgy of Cast Iron" consisted of a detailed description of the practice followed by the John Deere Tractor Co. foundry at Waterloo, Iowa, in the production of castings weighing up to about 850 pounds.

Type of scrap used in the cupolas is limited by the phosphorus content. It has been found uneconomical to use rails because of the high price, most of the scrap consumed being automotive and mixed No. 1 cast material. Cast iron borings and steel turnings in briquet form also are employed. Considerable economy has been effected by the installation of briquetting equipment to consume the light scrap produced by the plant's machining department. A saving of about $2 per ton in the use of briquets made it possible for this machine to pay for itself within less than a year, according to Mr. Bornstein.

The foundry has four cupolas, each with a capacity of 18 to 20 tons per hour. An average charge consists of 25 per cent pig iron, 4 per cent ferrosilicon, 27½ per cent return scrap, 2½ per cent No. 1 cast scrap, 21 per cent automotive scrap, 10 per cent borings, 7½ per cent turnings and 2½ per cent steel scrap. Typical analysis of iron produced includes: Carbon, 3.20-3.30; silicon, 2.25-2.40; sulphur, 0.12; phosphorus, 0.25; manganese, 0.55-0.57. Tensile strength is 35,000 to 40,000 pounds per square inch and brinell hardness 228.

Covered ladles are employed widely in transporting metal from the cupolas to the pouring floor. Ladles must travel 750 feet on lift trucks, and covered units have been found to eliminate the spilling hazard as well as to prevent too sharp a temperature drop. A temperature drop of 8 to 10 degrees per minute in the initial 10-minute period when using covered ladles compares with a drop of 15 to 23 degrees per minute with the open type ladle, it was shown.

Slides were presented by Mr. Bornstein to illustrate the various operating features of the foundry. Considerable discussion on different points followed the talk.

The nonferrous group meeting brought out much discussion relative to nonferrous melting practice. Mr. Kelin described the proper practice in preheating part of the charge, recommending that the metal be placed so as not to come in direct contact with the furnace flame. Effects of addition of gates and risers were discussed, and the use of deoxidizers in the production of red brass and tin bronze was explained. For the latter purpose, phosphor-copper and phosphor-tin may be employed.—*W. G. Gude.*

Connecticut

GEORGE BELKNAP, Belknap Mfg. Co., Bridgeport, Conn., spoke on "Cores and Machine Core Blowing" at the regular meeting of the Connecticut Nonferrous Foundrymen's association held Dec. 21 at the Hotel Duncan, New Haven, Conn. Mr. Belknap pointed out various interesting features connected with core making problems. Retiring president, T. Joseph Judge, Jenkins Bros. Co., Bridgeport, presided.

The following officers were elected for 1938: President, H. A. Phelps, Phelps Foundry Co., Ansonia, Conn.; vice president, D. Wesley Case, Belknap Mfg. Co., Bridgeport; treasurer, Ernest Stone, Consolidated Ashcroft-Hancock Co., Bridgeport; secretary, Louis G. Tarantino, Niagara Falls Smelting & Refining Corp., Bridgeport; technical secretary, L. A. Ward, Chase Brass & Copper Co., Waterbury, Conn. The executive committee is composed of the following: T. Joseph Judge, chairman; S. W. Chappell, Electric Boat Co., Groton, Conn.; F. B. Clarke, Whitehead Bros. Co., Providence, R. I.; Byron Ried, Reading, Pratt & Cady Co., Hartford; George King, Malleable Iron Fittings Co., Branford, Conn.—*Louis G. Tarantino.*

St. Louis Chapter Starts Course

A special evening course was inaugurated at the Ranken Trade school, 4431 Finney avenue, St. Louis, Wednesday night, Jan. 12. The course will consist of 12 lessons of four hours each covering the period from 6:30 to 10:30 p. m.

This course, which is sponsored by the St. Louis Chapter of the American Foundrymen's association, is designed to meet the needs of molders, coremakers, apprentices, salesmen, patternmakers and all others allied with the foundry industry. A practical foundryman serves as instructor. He has had a wide experience in modern foundry practice and possesses the underlying theory as well as the practical phases of foundry work.

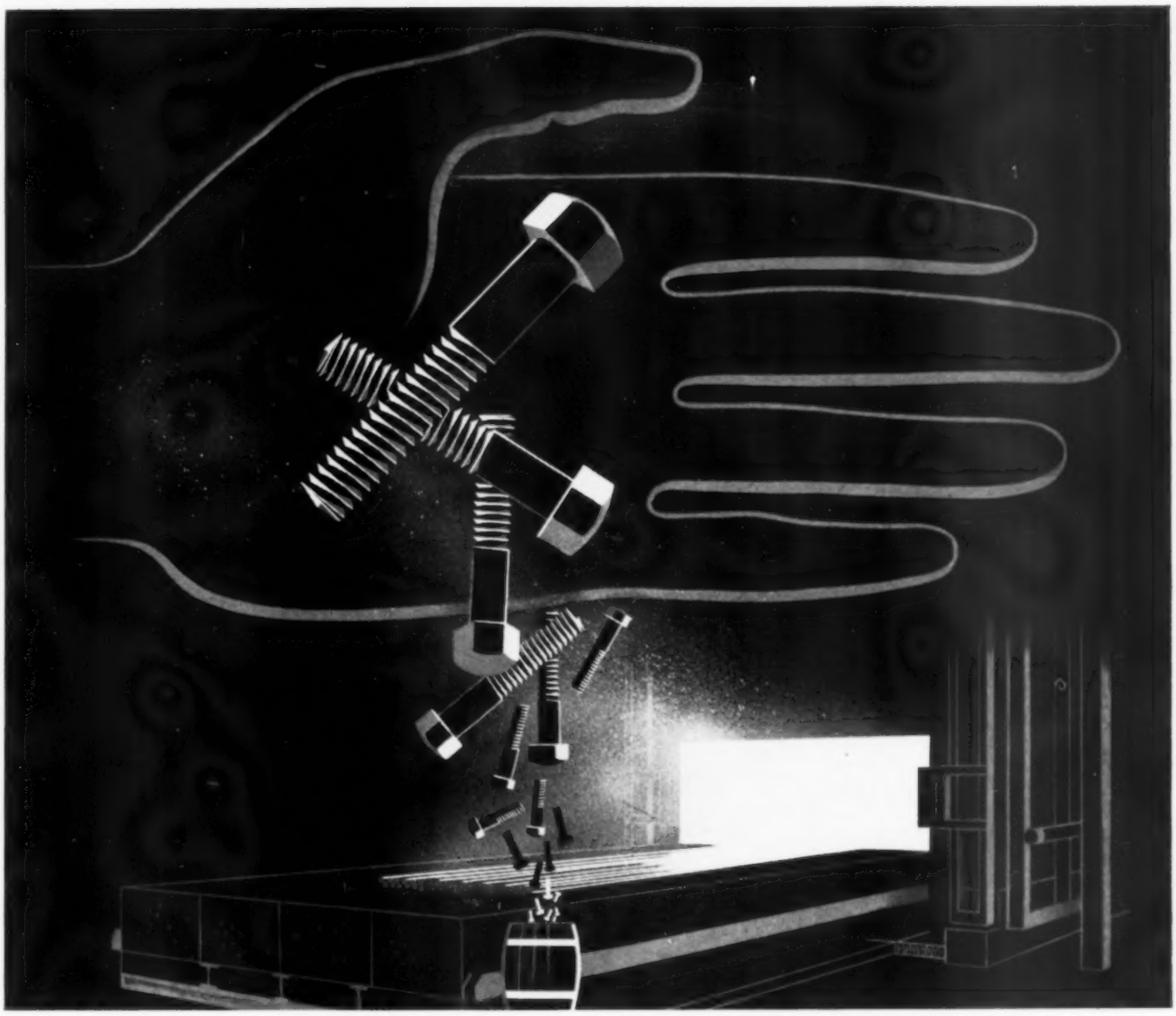
Each evening's work will be divided into two parts. One part consists of a discussion of modern foundry practice and the remainder is devoted to discussion and answering the questions of the students. The instruction is under the supervision of the educational committee of the St. Louis chapter.

Book Review

How to Be a Good Foreman, by Charles Reitell, 186 pages, published by the Ronald Press Co., New York, and supplied through THE FOUNDRY, Cleveland, for $1.50 and in Europe by the Penton Publishing Co. Ltd., London.

A wide variety of details which must be understood by the foreman to make progress in modern industry, is contained in this interesting book. Since the foreman must have a mastery of the human element, a grasp of technical requirements, and a knowledge and use of costs and budgetary control, the book has been divided into those three main sections. Twenty-five illustrations are included to further embellish the text.

The book may be used either for individual study or as a text and guide for foremen's classes where this form of activity is practiced in any plant.



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Any engineering or production head interested in turning out a better product at lower cost will do well to look deeply into Moly steels and irons. Our technical book, "Molybdenum," is free for the asking. Climax Molybdenum Co., 500 Fifth Ave., New York.

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Plan Cleveland Activities

(*Continued from page* 27)

the Northeastern Ohio chapter of the A.F.A. have been appointed as follows:

General chairman, Bertram G. Parker, Youngstown Foundry & Machine Co., Youngstown, O.; general vice chairman, Leroy P. Robinson, Werner G. Smith Co.; general secretary, John Tressler, Hickman, Williams & Co.; and general treasurer, R. F. Lincoln, Osborn Mfg. Co.

Committee Members Listed

Welcoming Committee: Chairman, James L. Wick Jr., Falcon Bronze Co., Youngstown, O.; vice chairman, Benjamin D. Fuller, Whitehead Bros. Co., N. G. Baker, Steel Founders' Society of America, J. C. Beattie, Fulton Foundry & Machine Co., R. E. Beebe, National Malleable & Steel Castings Co., Robert E. Belt, Malleable Founders' society, G. A. Boesger, W. W. Sly Mfg. Co., T. L. Boldman, W. S. Tyler Co., J. T. Booth, National Malleable & Steel Castings Co., H. M. Boylston, Case School of Applied Science, E. S. Carman, Edwin S. Carman Inc., W. C. Corbeau, National Malleable & Steel Castings Co., Pat Dwyer, THE FOUNDRY, W. H. Eiseman, American Society for Metals, A. N. Farmers, Sand Products Corp., George W. Fleig, Smith Facing & Supply Co., James H. Herron, James H. Herron Co., L. F. Herron, James H. Herron Co., C. F. Hess, Ohio Injector Co., Wadsworth, O., Roy S. Hoffman, Hoffman Foundry Supply Co., L. W. Kempf, Aluminum Co. of America, D. P. Lansdowne, West Steel Castings Co., W. C. Manwell, Fulton Foundry & Machine Co., C. B. Murray, Crowell & Murray, L. W. Olson, Ohio Brass Co., Mansfield, O., John A. Penton, Penton Publishing Co., H. A. Reece, Meehanite Metal Corp., W. W. Rose, Gray Iron Founders' society, D. J. Ryan, Allyne-Ryan Foundry Co., C. A. Schmidle, Republic Steel Corp., H. A. Schwartz, National Malleable & Steel Castings Co., W. L. Seelbach, Forest City Foundries Co., F. G. Smith, Osborn Mfg. Co., W. G. Smith, Werner G. Smith Co., A. Tumpack, Ferro Machine & Foundry Co., J. Turick, Wood & Metal Pattern Co., S. C. Vessy, W. W. Sly Mfg. Co., Fred L. Wolf, Ohio Brass Co., Mansfield, O., F. C. Woody, National Malleable & Steel Castings Co., and M. W. Zeman, Osborn Mfg. Co.

N.E.O. Day Committee: Chairman, Ralph West, West Steel Casting Co.; vice chairman, B. F. Lambert, Diamond Alkali Co., R. Arnold, Burch Corp., Crestline, O., F. E. Bair, Ohio Brass Co., Mansfield, O., Milo Barrett, Chandler & Price Co., F. Barton, Fulton Foundry & Machine Co., H. F. Bradway, Henry Furnace & Foundry Co., Medina, O., C. Brecknock, Lorain Castings Co., Lorain, O., Edwin Bremer, THE FOUNDRY, J. V. Brost, Brost Pattern Works, Lloyd Brown, Duplex Mfg. & Foundry Co., Elyria, O., C. A. Carroll, G. & C. Foundry Co., Sandusky, O., H. B. Castleman, Farrell-Cheek Steel Co., Sandusky, O., Frank Cech, Cleveland Trade school, W. Chatfield, Fate-Root-Heath Co., Plymouth, O., R. E. Clisby, Sterling Foundry Co., Wellington, O., H. J. Colby, Fanner Mfg. Co., R. N. Cole, Canton Malleable Iron Co., Canton, O., W. Cowell, Forest City Foundries Co., L. A. Dunn, General Electric Co., Erie, Pa., J. M. Emery, Massillon Steel Casting Co., Massillon, O., W. N. Ewing, National Malleable & Steel Castings Co., J. Gallagher, Otis Steel Co., P. C. Geoghegan, Ohio Foundry Co., W. L. Glass, Deming Co., Salem, O., D. J. Gluntz, Gluntz Brass Co., W. F. Gollmar, Elyria Foundry Co., Elyria, O., R. W. Griswold, Griswold Mfg. Co., Erie, Pa., E. C. Harr, Fox Furnace Co., Elyria, O., W. A. Harris, Carnegie-Illinois Steel Corp., Canton, O., E. J. Hedlund, Urick Foundry Co., Erie, Pa., C. A. Heisler, A. C. Williams Co., Ravenna, O., J. Ward Henry, Electro Alloys Co., Elyria, O., E. F. Hess, Ohio Injector Co., Wadsworth, O., C. Hockman, Parker-Street Castings Co., R. E. Hug, Colonial Foundry Co., Louisville, Ky., J. W. Jackson, Cleveland Production Co., C. Jarecki, Jarecki Mfg. Co., Erie, Pa., George A. Johnson, Ashland Malleable Co., Ashland, O., L. W. Kingsbury, Standard Stoker Co., Erie Pa., F. A. Klohs, Ohio Brass Co., Mansfield, O., L. Krauss, Diamond Foundry Co., Akron, O., F. E. McCabe, Grabler Mfg. Co., H. S. McKinnon, McKinnon Iron Works Co., Ashtabula, O., C. R. McLean, American Steel Foundries, Alliance, O., George McNab, Hill Clutch Machine & Foundry Co., F. B. Mahoney, Humphreyes Mfg. Co., Mansfield, O., R. Maneely, Apex Electric & Mfg. Co., S. S. Marquard, Hagan Foundry Co., Orrville, O., C. J. Miller, Fremont Foundry Co., Fremont, O., H. G. Nicholas, Quality Casting Co., Orrville, O., B. S. Parker, Youngstown Foundry & Machine Co., Youngstown, O., W. Prentice, Geneva Metal Wheel Co., Geneva, O., F. Proshek, Cuyahoga Foundry Co., W. G. Quayle, Eberhard Mfg. Co., E. T. Remy, Schill Mfg. Co., Crestline, O., M. Reymann, Atlantic Foundry Co., Akron, O., N. Roach, Cleveland Brass Co., Canton, O., S. P. Schloss, Superior Foundry Co., C. C. Scott, Coe Mfg. Co., Painesville, O., C. H. Shurmer, Norwalk Foundry Co., Norwalk, O., A. R. Silver, Quaker City Foundry Co., Salem, O., F. H. Sloan, Union Metal & Mfg. Co., Canton, O., E. H. Snyder, Hess-Snyder Co., Massillon, O., E. W. Spade, Champion Hardware Co., Geneva, O., F. Stanley, Crucible Steel Castings Co., A. C. Steer, Sandusky Foundry & Machine Co., Sandusky, O., D. V. Stewart, Columbiana Pump Co., Columbiana, O., F. A. Stewart, National Malleable & Steel Castings Co., L. L. Swift, Cleveland Graphite Bronze Co., P. Tompkins, W. O. Larson Foundry Co., Grafton, O., W. C. Transue, Ohio Cultivator Co., Bellevue, O., W. E. Trump, Machined Steel Castings Co., Alliance, O., V. A. Walker, Pitcairn Co., Barberton, O., George Walton, Madison Foundry Co., T. C. Watt, Falcon Bronze Co., Youngstown, O., L. A. Way, Columbiana Foundry Co., Columbiana, O., J. C. Weisenbach, City Foundry Co., D. Wellman, Wellman Bronze

(*Concluded on page* 65)

Tentative Schedule Of Sessions

Monday—May 16

9:00 a. m. Opening Session
10:00 a. m. Gray Iron
Nonferrous
12:30 p. m. Chapter Conference Luncheon
2:00 p. m. Foreman and Apprentice Training
Pattern Making
Gray Iron
4:00 p. m. Cast Iron Shop Course
6:30 p. m. Instructors Dinner
8:00 p. m. Refractories
Job Evaluation

Tuesday—May 17

8:30 a. m. Sand Shop Course
10:00 a. m. Nonferrous
Steel
Gray Iron
12:30 p. m. Nonferrous Round Table Luncheon
Gray Iron Round Table Luncheon
2:00 p. m. Apprentice Training
Foundry Costs
Steel
4:00 p. m. Cast Iron Shop Course
Evening—Stag Dinner

Wednesday—May 18

8:30 a. m. Sand Shop Course
10:00 a. m. Malleable
Steel
Sand Research
12:30 p. m. Steel Round Table Luncheon
Conference
2:00 p. m. Safety
Cast Iron Shop Course
Malleable Foundry Shop Course
4:00 p. m. Business meeting and Special Lecturer
Evening—Annual Dinner

Thursday—May 19

8:30 a. m. Sand Shop Course
10:00 a. m. Malleable Iron
Materials Handling
12:30 p. m. Malleable Round Table Conference
2:00 p. m. Hygiene
4:00 p. m. Cast Iron Shop Course
Malleable Foundry Shop Course

(*Concluded from page* 62)

& Aluminum Co., and F. L. Wolf, Ohio Brass Co., Mansfield, O.

Golf Committee: Chairman, J. H. Bruce, Bowler Foundry Co.; vice chairman, M. J. Sweeney, Allyne-Ryan Foundry Co., C. A. Barnett, Foundry Equipment Co., R. S. Fox, Republic Steel Corp., Walter Larson, W. O. Larson Foundry Co., Grafton, O., and S. C. Vessy, W. W. Sly Mfg. Co.

Transportation Committee: Chairman, R. E. Williams, Chicago Pneumatic Tool Co.; vice chairman, Fred Ebeling, W. W. Sly Mfg. Co., T. P. Agnew, Bowler Foundry Co., F. J. Fredericksen, Westinghouse Electric & Mfg. Co., J. Mader, Apex Electric & Mfg. Co., J. A. Sindelar, East Ohio Gas Co., M. Tilley, National Malleable & Steel Castings Co., and H. Trenkamp, Ohio Foundry Co.

Banquet Committee: Chairman, W. L. Seelbach, Forest City Foundries Co.; vice chairman, J. H. Redhead, Lake City Malleable Co., R. Ditty, Federal Foundry Supply Co., J. H. Lansing, Malleable Founders' society, George J. Leroux, National Malleable & Steel Castings Co., and H. A. Schwartz, National Malleable & Steel Castings Co.

Hotel Committee: Chairman, Dan McAvoy, Grabler Mfg. Co.; secretary, Mark Egan, Cleveland Convention Bureau, P. Moreen, Meech Foundry Co., S. P. Robinson, Otis Steel Co., and E. C. Zirzow, National Malleable & Steel Castings Co.

Ladies' Entertainment Committee: General chairman, B. R. Pearse, Atlas Foundry Co.; chairman, Mrs. A. J. Tuscany; vice chairmen, Mrs. R. F. Lincoln, Mrs. B. G. Parker, Mrs. B. R. Pearse, Mrs. L. P. Robinson, Mrs. F. G. Steinebach, and Mrs. J. H. Tressler; Mrs. Homer Britton, Mrs. J. H. Bruce, Mrs. A. C. Denison, Mrs. F. J. Dost, Mrs. Fred Ebeling, Mrs. F. Ray Fleig, Mrs. B. D. Fuller, Mrs. Ralph Hisey, Mrs. B. F. Lambert, Mrs. Dan McAvoy, Mrs. H. L. McKinnon, Mrs. J. H. Redhead, Mrs. H. A. Schwartz, Mrs. Charles Seelbach, Mrs. Walter Seelbach, Mrs. W. C. Sly, Mrs. Werner G. Smith, Mrs. P. J. Strangward, Mrs. M. J. Sweeney, Mrs. S. C. Vessy, Mrs. Ralph West, Mrs. James L. Wick, Mrs. R. E. Williams, and Mrs. J. J. Witenhafer.

Stag Party Committee: Chairman, L. P. Robinson, Werner G. Smith Co.; vice chairman, A. J. Tuscany, Foundry Equipment Manufacturers' association, J. D. Alexander, American Foundry Equipment Co., G. H. Angell, Angell Nail & Chaplet Co., A. F. Anjeskey, Cleveland Crane & Engineering Co., W. A. Armstrong, Ingersoll-Rand Co., H. A. Baker, Oiless Core Binder Co., N. G. Baker, Steel Founders' Society of America, R. P. Balph, Harbison-Walker Refractories Co., Zeno D. Barnes, Ajax Metal Co., J. L. Battenfeld, Johnston & Jennings Co., E. A. Beisel, Steel Blast Abrasives Co., Robert E. Belt, Malleable Founders' society, W. D. Bennett, Norton Co., E. A. Burr, Cleveland Quarries Co., E. Cannon, Cannon Vibrator Co., B. L. Chamberlin, Albany Sand & Supply Co., O. D. Clay, Tuscora Foundry Sand Co., J. Cleary, Sand Products Corp., H. W. Collinson, Carborundum Co., O. D. Conover, Cleveland, J. S. Coxey Jr., Industrial Silica Co., Youngstown, O., J. A. Crew, Ayers Mineral Co., Zanesville, O., C. H. Dittrick, Acheson Graphite Corp., E. T. Doddridge, Wm. B. Nicholls Inc., R. E. Donnelly, Pangborn Corp., T. Dougherty, Dougherty Lumber Co., R. Fisher, Carnegie-Illinois Steel Co., L. H. Heyl, Federal Foundry Supply Co., R. S. Hoffman, Hoffman Foundry Supply Co., E. T. Kindt, Kindt-Collins Co., B. F. Lambert, Diamond Alkali Co., J. M. Lathrop, THE FOUNDRY, George Lenz, Republic Steel Corp., A. A. Markee, Linde Air Products Co., S. M. Marks, H. Kramer & Co., P. McConnell, Globe Steel Abrasive Co., Mansfield, O., H. L. McKinnon, C. O. Bartlett & Snow Co., L. O. Millard, Link-Belt Co., L. Miller, Osborn Mfg. Co., F. L. Moore, Peerless Mineral Products Co., R. H. Moore, National Engineering Co., C. C. Nash, Foundry Equipment Co., C. Nock Jr., Nock Fire Brick Co., J. E. O'Brien, Fanner Mfg. Co., Frank Opatrny, Frederic B. Stevens Inc., J. S. Parker, SPO Inc., C. D. Pinkerton, Smith Facing & Supply Co., W. M. Ramsey, Pickands Mather & Co., W. E. Rayle, Werner G. Smith Co., H. F. Roberts, Williams & Co., W. W. Rose, Gray Iron Founders' society, Paul H. Shaiffer, Ohio Ferro Alloys Co., Canton, O., J. A. Shomer, Fire Brick Engineering Inc., A. D. Smith, Bethlehem Steel Co., Styles Smith, Smith Power Transmission Co., P. M. Snyder, Climax Molybdenum Co., T. Terry, Federal Foundry Supply Co., M. G. Thomas, City Foundry Co., J. H. Tressler, Hickman, Williams & Co., John Warren, Jeffrey Mfg. Co., Paul Wheeler, Link-Belt Co., J. S. Wilbur, Electro Metallurgical Sales Corp., and L. H. Williston, Williston Fire Brick Co.

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Publicity Committee: Chairman, Frank G. Steinebach, THE FOUNDRY; vice chairman, F. J. Dost, Sterling Foundry Co., Wellington, O., H. M. Greenbaum, Acme Foundry Co., D. O. James, *The Iron Age*, E. F. Ross, *Steel*, R. Wieland, Forest City Foundries Co.

Book Review

La Fatigue des Metaux, by R. Cazaud and L. Persoz, paper, 190 pages, 6¼ x 9¾ inches, published by Dunod, Paris, France, and supplied by THE FOUNDRY, Cleveland, and in Europe by the Penton Publishing Co. Ltd., London.

This volume, which is in French, is devoted to fatigue of metals and is intended for engineers, designers and others associated with all branches of mechanical construction. It aims to supply first the necessary guidance for choice of metals best suited for the purpose intended, and second methods for determining the best combination which will give maximum resistance with minimum weight. Fatigue limits of various metals are compared with other physical characteristics, and descriptions are given of the various machines employed for determining fatigue limits.

The book is divided into 8 chapters of which the first relates to the historical and general phases. Chapter II deals with the character of ruptures from fatigue, and Chapter III discusses the theories of the mechanism of fatigue. Determination of fatigue limits and machines for its execution are described in Chapter IV while Chapter V is devoted to fatigue limits of metals and alloys. Chapter VI discusses the influence of various factors on fatigue. Chapter VII deals with the fatigue resistance of riveted, welded and brazed assemblies, and Chapter VIII discusses the practical applications of fatigue limits. At the end of each chapter an extensive bibliography is given to aid the reader in further reference.

Infections resulting from hand handling and manipulation of materials are said to be responsible for payment of compensation cost of $20,000,000 per year.

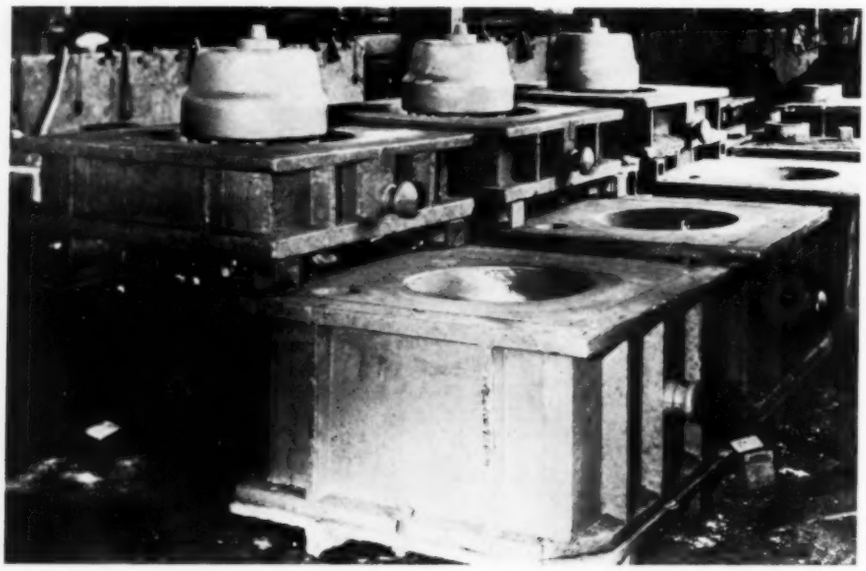

Fig. 7—Castings are made in heavily ribbed, substantial cast iron flasks

Rams Large Molds

(*Continued from page* 26)

order books of the company are made at the Mt. Vernon plant. Small and medium weight castings are made at the plant operated in Grove City, Pa.

First established as a modest little foundry at Mt. Vernon in 1833 the company early engaged in the manufacture of engines of various types driven by steam. With increased facilities and knowledge based on experience larger units were developed from time to time and included corliss engines, blowing engines for blast furnaces and pumping engines for water systems. Development of oil and gas fields and introduction of gas and oil as motive fuels led the company to gradually abandon the steam engine field and take up the manufacture of gas and diesel engines and compressors. At present the combined capacity of the two foundries with a floor space of 237,000 square feet is 4,000,000-5,000,000 pounds per month. Equipment includes four cupolas, 22 floor operated jib and traveling cranes, and 18 large capacity traveling electric cranes capable of lifting loads up to 50 tons. Molding machine equipment includes two plain jolt and two jolt rollover machines made by the Herman Pneumatic Machine Co., Pittsburgh.

The latest addition to the equipment is a jolt ram type molding machine capable of handling a load of well over 50 tons. Built by the Arcade Mfg. Co., Freeport, Ill., and equipped with two jolting cylinders, the machine is mounted in a pit in the floor at a height that brings the top flush with the floor level as shown in Fig. 5. This illustration also shows a standard 24 x 36-inch gas engine bed pattern mounted on the planed cast iron plate. Within definite limits of course the plate may be utilized for the support of smaller or larger patterns.

Patterns are arranged by measurement in definite position on the plate. Similar practice is followed in locating the cope upon another plate, so that cope and drag will coincide properly when the mold

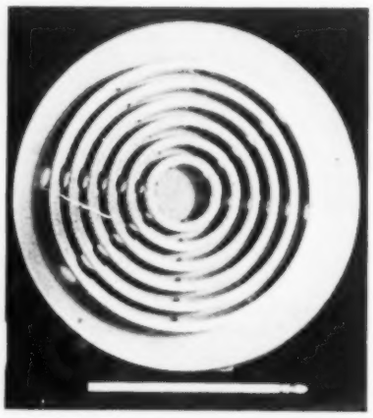

Fig. 8—Intricate valve core made in oil sand without rods, nails or wires

is assembled. The greater part of the joint is perfectly flat. Suitable marks on the cope plate indicate the proper positions for the gate sticks at both ends of the mold. Position and style of gates on this mold are shown in Figs. 4 and 6, views taken respectively from the power end and the compressor end of the bed.

Two ladles are employed to fill the mold with metal. They are suspended from cranes above each end. Metal from each ladle fills a pouring basin on top of the cope. Cast iron plugs coated with blacking prevent the metal from entering the sprues until the basin is nearly filled. The plugs then are removed and the metal flows down through two sprues to a short horizontal runner cut in the joint face of the mold. This breaks the direct fall of the metal so that it flows more gently down through two sprues terminating in gates which convey the metal into the bottom of the mold.

Cores Held by Chaplets

Figs. 4 and 6 show the engine bed mold after it has been dried and placed in a pit in the floor for convenience in setting the cores and for pouring. Some of the cores are in position in the mold while the others are shown in the background of Fig. 6. The cores are supported by prints at the bottom and held in place laterally by stud chaplets. The large body of sand in the center is formed by the pattern and contains a quantity of coke to facilitate drying and rapid escape of the vent when the mold is filled with iron. Several openings are provided on the top of this core for the escape of steam during the drying period. These openings are closed with sand after the cores have been placed in the mold.

Molds and cores for power cylinder heads shown in Figs. 2, 3, and 7 are typical of the equipment and methods employed in securing clean, solid castings. The solid, substantial cast iron flasks prevent the molds from straining when they are filled with iron. Experienced foundrymen will note that position of the casting and method of gating are in opposition to the usually held theory that the machined face of a casting should be on the bottom, and the metal should enter at the top. In this instance the casting is machined all over, therefore one machined face of the casting is in the cope. The metal enters the mold through a gate at the bottom. Successful production of the castings according to the method outlined seems to be just another one of these foundry instances where theory and practice do not exactly coincide. It is claimed that a few castings molded in the opposite position failed to meet the pressure test. Molded in the position shown in the accompanying illustrations, no casting fails in this test.

These molds are rammed on a jolt machine and then dried in the

(*Concluded on page* 68)

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INCREASE EFFICIENCY

Through these five basic advantages

1—Can't break—can't burn
2—Rolled Sections—easier handling
3—Great torsional strength
4—Save sand and floor space
5—Withstand machine pressures

STERLING WHEELBARROW CO. 7100 W. WALKER STREET MILWAUKEE, WISCONSIN

(*Concluded from page 66*)

oven. Upon removal from the oven they are set up on the floor as shown with the copes in an inverted position. The cores with long bolts attached are lowered into place and located by suitable prints. With nuts and washers the bolts are drawn tight and the cores are anchored securely. A comparatively light ring or jacket core in the cope flange and shown in Fig. 3, is suspended in a similar manner by several strands of wire. On the outside top of the cope the wires are twisted around rods resting on the bars of the cope. Necessary tension on the rods is secured by driving wood wedges under them.

Ovens Fired With Gas

General view of the core room with ovens in the background is shown in Fig. 1. The ovens are fired with gas through long perforated pipes laid on the floor at either side near the walls. Majority of the cores are made by facing the inside of the corebox with a silica sand bonded with oil. The remainder of the space is filled with a mixture of new and old sand bonded with a pitch base compound and a small amount of cereal binder. The oil sand facing produces a clean, smooth skin on the castings, while the use of the other material reduces the total cost of the cores. Also the oil sand facing disintegrates readily from the heat of the metal and thus facilitates removal of the cores from the castings. Coke or cinders are employed freely in the inside of many cores to reduce the drying time, to save sand and to facilitate removal from the casting.

In certain instances oil sand is employed exclusively. For example in the core shown in Fig. 8, for a compressor valve seat, the mixture is a crushed silica rock bonded with oil. This core is made on a rollover machine supplied by the Champion Foundry & Machine Co., Chicago and contains no rods or nails. The permeability is so high that no artificial venting is required.

The Cooper-Bessemer Corp., operates under license of the Meehanite Metal Corp., and all the iron melted conforms to the formulas developed by that corporation. It is claimed that the process insures accurate control of the size, quantity and uniformity of distribution of the graphite flakes in the iron whether in thick or thin sections. Hence, it presents the structural characteristics and qualities of a true alloy. To secure the desired results, a base metal is chosen of known physical characteristic, free from primary graphite and mechanical weakness. By the addition of certain materials and by the exact methods of control, the melter can precisely control the decomposition of the carbides and thus control both the form of the graphite and the nature of the matrix. The result is a close grained uniform casting with physical characteristics to meet exactly the desired specifications. The metal is classified in five different grades.

Metal is melted in a cupola lined to 72 inches. The charges are comparatively small, 2000 pounds of iron and 200 pounds coke. From the general storage in the yard, various component parts of the cupola charge are lifted by a crane and piled in a number of elevated bins along side a narrow gage railroad. The bottom of the bins is on a slant so that any desired amount of material readily may be pulled down into a scale car.

Book Review

Enameling of Cast Iron, by E. Shuetz, paper 150 pages, 6¾ x 9¼ inches, published by Wilhelm Knapp, Halle (Saale), Germany, and supplied by THE FOUNDRY, Cleveland, and in Europe by the Penton Publishing Co. Ltd., London.

This book, which is part 23 of a series of reference books comprising "Works Practice in Iron, Steel and Metal Foundries," edited by Hubert Hermanns' is in German, and relates to enameling of cast iron. It is divided into sections of varying length covering different phases of the subject. The first describes the goal of enameling which is followed by the historical aspects. Then follows raw materials and their properties. Molecular weight in relation to chemical combination is discussed as is weight loss of raw materials through heating.

Refractory components and fluxing components of raw materials are described, and that is followed by methods for determining the fluoride combination of oxides and of the silica loss through fluoride combination. Succeeding sections deal with methods of computing a recipe from a known analysis, and vice versa; calculating the effect of change in compounds in relation to each other; setting-up molecular formulas; specific gravity of enamel; coefficient of expansion; modulus of elasticity, and tensile strength.

Other sections deal with equipment for enameling works, melting furnaces, enameling ovens, tools, costs, statistics, pickling, testing of pickling baths, thickness of coating, new enameling materials, effect of raw materials on enamel composition, defects in enameling, removal of enamel, requirements of cast iron for enameling, and cleaning of castings.

George O. Desautels Co., Postal Station building, Indianapolis, and 114 East Washington street, Muncie, Ind. has been appointed sales representative in the central Indiana territory by the General Alloys Co., Boston. George R. Brammer and Charles L. Bunner are associated with the George O. Desautels Co.

Employes Make Presentations

SHOP employes of the Pangborn Corp., Hagerstown, Md., grouped together at Christmas and presented Thomas W. Pangborn, president; John C. Pangborn, vice president, and George S. Goodrich, general superintendent, with individual baskets of poinsettia and silver pledges of loyalty and affection in the shape of a loving cup, water pitcher and service tray, respectively. Presentation is shown in the accompanying photograph. Reading from left to right are Charles B. Spigler, Leonard Shank, George Green, Russell Miller, Vernon Stouffer, George S. Goodrich, Thomas W. Pangborn, John C. Pangborn, Thomas Poffenberger, Ira L. McKee, Thomas Allen and G. LeRoy Piper.

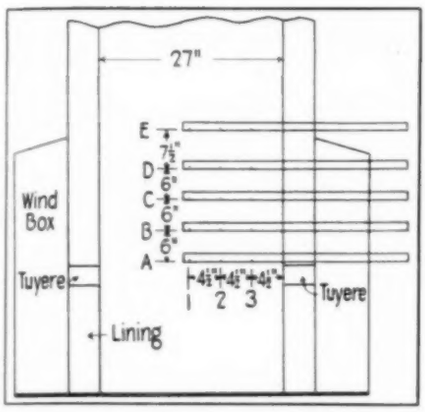


Fig. 3—Position of planes and gas-sampling, water-cooled tubes

Standardize Cupola Practice

(*Concluded from page* 30)

two parts CO_2 to one part CO with no free oxygen present.

On this basis a pound of carbon will require 2.22 pounds of oxygen for combustion (2.66 × 0.67) + (1.33 × 0.33). Since coke contains about 90 per cent carbon each pound of coke will require only 0.9 of this amount or 2.0 pounds of oxygen. Air contains 23.1 per cent oxygen by weight so 1 pound of coke will require 8.66 pounds of air for combustion.

As air, under standard conditions of 14.7 pounds per square inch pressure and 60 degrees Fahr., weighs 0.0765-pound per cubic foot 113.2 cubic feet of air are required per pound of coke burned. Actually an additional 10 per cent will be necessary for leakage and to provide a small amount of excess air always required for combustion in practice or a total of 124.5 cubic feet of air per pound of coke. Knowing the amount of metal melted per hour from a given cupola and the amount of coke burned it is an easy matter to compute the correct volume or weight of air required per minute.

Taking the data for the 60-inch cupola given in Table I we see that 14 tons per hour are melted or 9 charges per hour. Nine charges of coke weighing 390 pounds each are burned per hour or 3510 pounds. This equals 58.5 pounds per minute and requires 7283 cubic feet of air per minute or practically 7300 cubic feet per minute.

As air weighs 0.0765-pound per cubic foot, under standard conditions, 558 pounds of air per minute will be required. Blowers equipped with automatic air weight control devices are being used in increasing numbers to secure constant supply of air by weight regardless of atmospheric temperature, pressure and resistance in the cupola.

In some foundries even today the blast pressure only is watched as an indication of blast being used while in others a blast volume meter is used to measure the volume being used per minute. Unless suitable corrections are applied, use of a constant volume leads to large variations in weight of air and oxygen used since the volume of any gas varies directly as the absolute temperature and inversely as the pressure.

For example taking a volume figured as correct at 60 degrees Fahr. and 14.7 pounds barometric pressure as unity the same gas will expand 7.5 per cent at 100 degrees Fahr. and contract 11.5 per cent at 0 degrees Fahr. or a total volume change of about 19 per cent. Variations in atmospheric pressure also cause volume changes so it is readily seen that a constant weight of air is desired rather than a constant volume. The pressure gage on the windbox is of value in indicating the pressure against which the blower is working and of course variations in resistance to the blast flow in the cupola.

The only exhaustive research work done on investigating combustion conditions within the cupola was carried on by the U. S. Bureau of Mines in 1912 and 1913 and was reported in its bulletin 54, published in 1913. Some data also were published in the 1924 *Transactions* of the American Foundrymen's association by J. Grennan. In the Bureau of Mines tests a small (36-inch shell) cupola lined to 27 inches was used.

Gas sampling tubes cooled with circulating water were inserted in the fuel bed through the side of the cupola at heights of 1, 7, 13, 20 and 26.5 inches above the top of the tuyeres. Gas samples were taken at the center, at one third the radial distance from the center (two thirds the radial distance from the lining) and at two thirds the radial distance from the center (one third the radial distance from the lining) in each plane. Fig. 3 shows the setup.

Coke only, with no metal charges, was used in the tests. The sand bottom was 3 inches below the bottom of the tuyeres. A wood fire was started and 24 inches of bed coke put in and burned through carefully. Additional coke was added to within 6 inches of the charging door. The wood was burned out entirely before charging was completed. After 10 minutes the blast was put on and after 15 minutes operation gas-sampling was started and continued for 15 minutes.

The blast used was 1013 cubic feet per minute and the pressure 5.3 ounces. The tests were repeated five times and the samples analyzed. The average results are given in Table II. The letters *A*, *B*, *C*, *D* and *E* correspond to the planes shown in Figs 3 and 4 and the numbers 1, 2 and 3 to the positions also shown in Fig. 3.

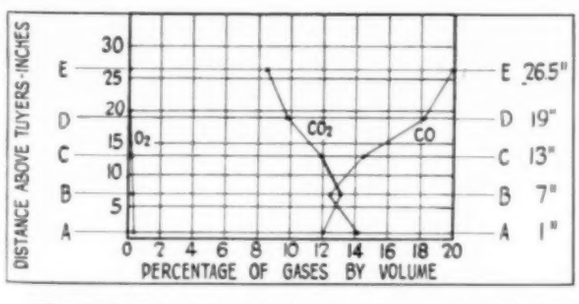


Fig. 4—Percentage variation in oxygen, carbon dioxide and carbon monoxide at different heights on the centerline of the cupola. Blast volume 1013 cubic feet per minute; pressure 5.3 ounces per square inch

Book Review

Magnesium and Its Alloys, by J. L. Haughton and W. E. Prytherch, board, 100 pages, 6 x 9½ inches, published by His Majesty's Stationery Office, London, England, and supplied by THE FOUNDRY, Cleveland, for 2 shillings, 6 pence, and in England by the Penton Publishing Co. Ltd., London.

During the past 5 years an investigation of magnesium and its alloys has been conducted at the National Physical Laboratory, Teddington, England, and while numerous results were published, considerable material remained unpublished. In view of the latter, the Metallurgy Research board deemed it advisable to collect the results of that material and publish them.

The work is divided into seven chapters of which the first deals with sources, production and properties of magnesium. Chapter II discusses melting and casting briefly while Chapter III describes plastic deformation of magnesium and its alloys. Rolling, forging, extrusion and heat treatment of magnesium and its alloys are the topics of Chapter IV, and Chapter V presents detailed data on the mechanical properties of magnesium alloys at room temperature. Chapter VI describes the mechanical properties of magnesium alloys at elevated temperatures, and Chapter VII discusses the constitution of the alloys of magnesium.

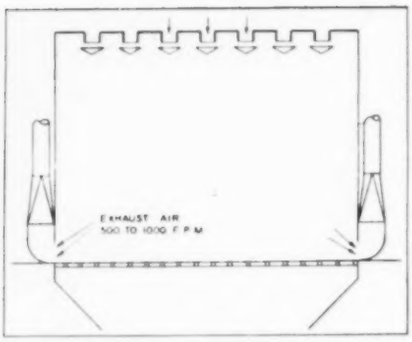


Fig. 10—Air enters the room through louvers in the ceiling

Exhaust Controls Dust

(*Continued from page* 31)

the disconnected mill unless the branch is dampered, and the volume exhausted from other mills connected to the same system will be reduced.

Blast cleaning operations require the exhaust of dust laden air from their enclosures. Equipment used includes the manually operated as well as the airless, automatic and semiautomatic types, using either sand, steel grit, or shot for the blasting medium.

Air is exhausted from blasting equipment not only to prevent dust escaping, but also to improve visibility and maintain the abrasive at its maximum cutting efficiency by removing fine, shattered particles.

Exhaust requirements from blasting rooms are based on air changes within the enclosure and vary from 10 to 15 air changes per minute.

Variations

WITH the obviously wide variation in equipment design and foundry procedure, any engineering data presented must be used only as a guide for average requirements, and when necessary should be modified in accordance with intensity of dust generation and the type of hood or enclosure which it is possible to employ under the particular circumstances.

This article, and the one which appeared previously in the January issue, were prepared under the auspices of the Engineering committee of the Dust Control Equipment association. While that committee has reviewed Mr. Kane's paper and endorses the general premises, the committee directs attention that its endorsement is given with the above explanation.

The Editors.

Latest practice recommends 15 air changes per minute as desirable. Air preferably enters the room, Fig. 10, through louvers in the ceiling, flowing downward to exhaust connections in the walls at the floor line. Inlet openings must be louvered carefully and minimum entering air velocities of 1000 feet per minute must be maintained to prevent dust escaping. Rooms must be provided with tight doors which must be closed during the cleaning period. Air should enter the exhaust hoods at velocities not exceeding 1000 feet per minute or abrasive will be removed with the exhausted fines.

Regardless of the volume of air exhausted, it is imperative that workmen within the booth be provided with positive pressure helmets supplied with clean air. Fine dust is generated so rapidly that it is impossible to protect workmen by a general exhaust from the room.

Determine Exhaust Volumes

The required exhaust volumes from specially designed blast cleaning equipment should be obtained from the equipment manufacturer. This volume can be approximated from the size of branch connections which is provided and through which velocities of approximately 3500 feet per minute are exhausted.

Most states have regulations specifying the branch size and air volume requirements for various size grinding, polishing, buffing, scratch brushing, and disk grinding operations. Where exhaust requirements are not specified, the recommendations of the American Foundrymen's association tentative code reprint No. 36-28, should be followed. These recommendations are condensed in Table III.

Grinding wheels usually can be effectively enclosed, and with some study typical hoods can be developed for such operations.

Dust control involves more than the selection of proper exhaust volumes. Success of an installation requires correct design of hoods and enclosures, proper pipes and main ducts, installation of an exhauster of sufficient capacity and pressure to convey that air volume through the exhaust system, and selection

(*Concluded on page* 74)

Table VI

Exhaust from Tumbling Mills

Mill Diameter Inches	Branch Size Diameter, Inches
24	4
30	5
36	6
42	7
48	8
54	9
60	10

For square mills increase branch sizes 1-inch in diameter.

Table VII

Exhaust Requirements for Grinding Applications

Air Volume: 4500 feet per minute in all branches.
(2-inch suction at average hood)

Grinding or Cut-Off Wheels

Wheel Diameter, Inches	Maximum Thickness* Inches	Pipe Diameter, Inches
to 9...	1½	3
From 9 to 16...	2	4
16 to 19...	3	4½
19 to 24...	4	5
24 to 30...	5	6
30 to 36...	6	7

Buffing, Polishing and Scratch Brushing

Wheel Diameter, Inches	Maximum Thickness* Inches	Pipe Diameter, Inches
to 9...	2	3½
From 9 to 16...	3	4½
16 to 19...	4	5
19 to 24...	5	5½
24 to 30...	6	6½

Horizontal Single Spindle Disk Grinder

Wheel Diameter, Inches	Branch Size, Inches
to 12....	3
From 12 to 19....	4
19 to 30....	5
30 to 36....	6

Horizontal Double Spindle Disk Grinder

Wheel Diameter, Inches	Branch Size, Inches
to 19....	1–5
From 19 to 25....	1–6
25 to 30....	1–7
30 to 53....	2–6
53 to 72....	4–8

Vertical Single Spindle Disk Grinder

Wheel Diameter, Inches	Branch Size, Inches
to 20....	1–4½
From 20 to 30....	2–4
30 to 53....	2–6
53 to 72....	2–8

Grinding or Polishing Belts

To 3 inches wide—3-inch branch. Add ½-inch to branch diameter for each 2 inches or fraction increase in belt width over 3 inches.

*Increase branch area in proportion to thickness of wheel for wheels thicker than noted. Excerpts from Tentative Code of Recommended Practices for Grinding, Polishing and Buffing Equipment Sanitation; Reprint 36-28 of American Foundrymen's association.

For over forty years Herman Molding Machines have been used in successful foundries throughout this country and abroad. The expression, "It's a Herman," has become a symbol that is associated with rapid, low cost production and perfectly made molds.

The Herman is a precision made machine having distinctive engineering features that are patented and therefore are not found in other machines.

It is an easy machine to operate. The operator need not leave the control stand as all operations are controlled by one valve. It has hydraulic action for mold rollover and pattern draw which is swift, smooth, and positive . . . there can be no jerky movement or slamming. An Automatic Timer controls the jarring and assures that all molds will be of proper and equal density. Any size mold is instantly clamped and unclamped. The Automatic Air-locked Equalizer assures perfect draws. Mold is deposited directly on roller conveyor. *The only molding machine on the market with* ALL *these features.*

Write today for full details on this most modern of molding machines.

MOLDING HERMAN MACHINES

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH, PA.

Table VIII

Consolidated Data on Recommended Sizes of Pipes

Operation or Equipment	Air Volume Cubic Feet per Minute	Branch Size	Hood Suction	Minimum Duct Velocities Branch* Ft. per Minute	Main* Ft. per Minute	Approximate Dust Concentrations Grains/Cu. Ft. Air
Shakeouts	Table I	Note 1	1.25 vp	3500	3500	
Hot Castings						1.0–10 grains
Cold Castings						0.5– 5 grains
Belt Transfer	Note 1	Table II	1.25 vp	3500	3500	0.3–2.0 grains
Magnetic Pulleys						
Bucket Elevators	Note 1	Table III	1.70	3500	3500	0.3–1.0 grains
Sand Screens	Table IV	Note 1	1.25	3500	3500	1.0–5.0 grains
Sand Bins	¾ Air Chngs./Min.	Note 1	1.7 vp	3000	3500	0.2–0.6 grains
Mixers, Mullers	Table V	Note 1	1.25	3000	3500	0.5–1.0 grains
Tumbling Mills	Note 1	Table VI	1.5–4.0	4000–4500	4000	Forgings 0.5–2.0 grains Avg. Cast. 4.0–20.0 Lg. Cores 10.0–60.0
Sand Blasting	10–15 Air	Note 1	1.25 vp	3500	3500	Sand 2.0–10.0
Rooms, Booths	Cgs./Min.					Steel Grit 1.0– 5.0
Mech. Equipment (Use Manufacturing Recommendations)			1.5 vp	3500	3500	5.0–20.0
Grinding	Table VII	Table VII	1.65 vp	4500	4000	0.2– 0.6

Note 1—Where either branch size or air volume is specified, the other can be obtained from Cubic Feet per Minute = Area of Branch (square feet) × Branch Velocities (feet per minute).

*Where an appreciable amount of moisture is present, the duct runs should be as short as possible and higher velocities in branches and mains may be required to prevent settling.

(*Concluded from page* 72)

of dust collecting equipment which will separate effectively the entrained dust from the exhaust air. Present practice for foundry exhaust equipment does not recommend the return of cleaned air from dust collectors.

In consolidated Table VIII, recommended branch sizes and branch and main pipe velocities have been noted. This table will serve as a guide in providing proper sized pipes through which the dust laden air will be conveyed from hoods or enclosures to exhausters and dust collecting equipment.

Adventures of Bill

(*Concluded from page* 51)

for which it is intended the buyer does not care whether it is called sea coal, foam of the sea or Christmas Night.

"I am not sufficiently curious to trace the derivation of the term, but if some enterprising young foundryman feels the urge to prepare a paper on the subject I suggest the following possibilities: (a) The first coal came from a place with an unpronounceable name in Wales. The first, third, seventh and fourteenth letter in the name was *C*. Hence the term *C* (sea) coal. (b) Coal was graded as *A*, *B* and *C*. The *C* coal was best for foundry facing. (c) A customer one day asked old Gaffer Gray how he secured such a clean skin on the castings. The gaffer picked up a handful of facing sand, rubbed it up and down on the handle of a shovel and showed the resulting shiny face with the laconic comment: 'See? Coal.' I think that covers the British situation. Personally I should place a bob or two on the Gaffer Gray theory.

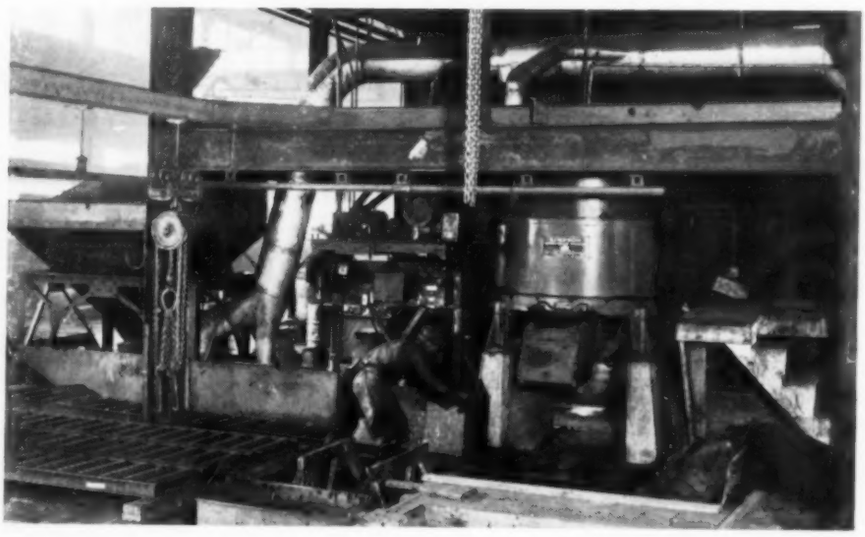
"In America I should not be surprised to learn that the term dates back to an incident where a band of patriots dumped a cargo of English coal in Boston harbor, and later cannily retrieved it to be sold under the term sea coal. What's that? It was a cargo of tea they dumped? Vos you dair, Sharlie?"

Has New Office

Snyder Foundry Supply Co. recently has moved into its new office and warehouse at 2444 East Fifty-seventh street, Los Angeles.

Successful accident prevention begins when management observes all rules and regulations.

Reconditions Molding Sand



A MIXING, reclamation and reconditioning unit installed at the plant of the Fulton Foundry & Machine Co., Cleveland includes a hopper with a screen top into which the sand is dumped from a grab bucket. The sand then is delivered through an electric feed mechanism to a vibrating screen and thence on a conveyor over a magnetic separator and drops into a charging hopper and thence into the mixer. From the mixer the sand passes through an aerator as it falls into boxes for transportation to various points in the shop. The mixing unit is hooded and exhaust piping runs to critical points where dust is developed. Suitable dampers regulate the amount of fines removed.—Illustration courtesy National Engineering Co., Chicago.

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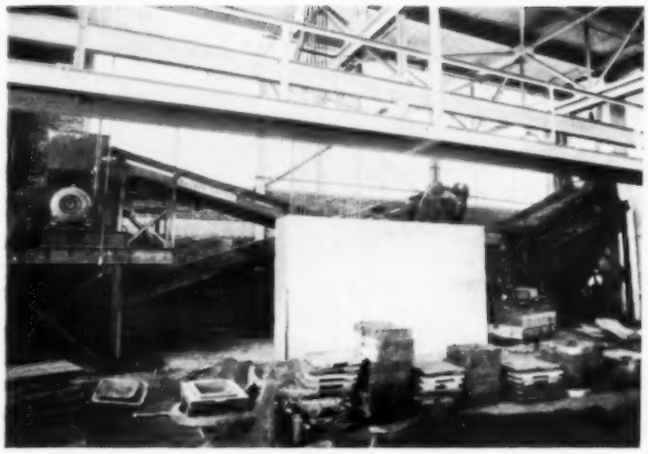

Fig. 9—Sand used in the foundry is carefully conditioned to obtain the best results

Equip Stove Shop

(*Concluded from page* 34)

delivered to the cleaning room in sheet steel boxes transported by electric elevating trucks. A platform conveyor, approximately 165 feet between centers, serves 22 snap flask molders. This conveyor travels past a pouring platform located adjacent to the cupola. A slat conveyor, about 30 inches wide, extends the full length of the pouring platform, and is operated at the same speed as the mold conveyor so that the pourers move with the mold conveyor. All snap flask molds are poured from hand ladles.

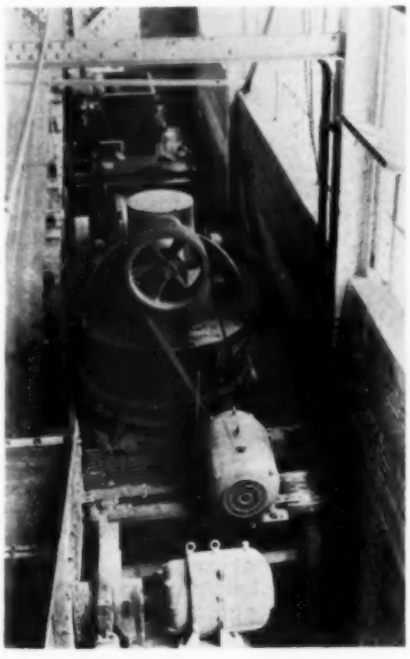

Fig. 10—Another view of some of the sand conditioning equipment

At the far end of the mold conveyor, a vibrating shake-out machine is so arranged that the castings are discharged on to a heavy duty hot casting apron conveyor which, in turn, delivers hot castings into large tote boxes for cooling. A view of the shake-out machine and conveyor is shown in Fig. 8.

The cleaning room located in the adjoining building is equipped with tumbling mills of various sizes, heavy duty floor stand grinders, special multiwheel top grinder, wheelabrator and sandblast. A dust collecting system includes four separate units and segregates the tumbling mills, sand blast and grinders, thus permitting flexibility and operating economy. The building is of conventional design with overhead skylights to insure adequate ventilation and natural daylight throughout. The entire floor area is covered with wood blocks on a concrete base.

Assembling department and cleaning room are separated by a brick wall extending to the roof. Finished castings are delivered to the assembling department and stored in large sheet metal bins. Four rows of power driven slat conveyors are used in progressive assembling. The finished product is crated and boxed at the far end of the assembling conveyor adjoining the warehouse. Finished castings are carried on trucks from the assembling conveyors to the warehouse for storage or shipment. This warehouse has separate loading docks for truck and rail shipment.

In planning this foundry and coordinate departments, the method of handling incoming raw materials, also sequence of operations, were given first consideration. With few exceptions, work in process flows in a straight line. A great deal of thought was given to insure ideal working conditions and comfort for the men, with special accommodations for white and colored help. The main object was to obtain a flexible and economical production unit and this was fully realized after only a few months operation. Further refinement and improvement are anticipated and will be inaugurated as conditions warrant.

Book Review

Inventions and Their Protection, by George V. Woodling, cloth, 316 pages, published by the Penton Publishing Co., Cleveland, and supplied by THE FOUNDRY, Cleveland, for $5 and in Europe by the Penton Publishing Co. Ltd., London.

This is an intensely practical book for engineers, designers, manufacturers, machine tool builders, furnace producers, toy makers, automotive engineers and others concerned with inventions and patents. In 16 chapters covering 316 pages the author presents patent law in a remarkably clear manner. Each chapter is well thought out and the facts are set forth clearly and concisely.

A sound and satisfying understanding of patent law, its design and administration, is impossible without a knowledge of the fundamental steps governing its structure, of certain significant facts determining its precepts, and of its precise use of words. A study of the work will clothe patent law with a new significance to many readers in the field of design engineering.

Nontechnical language has been used throughout. Much of the material has been inspired by actual questions which have confronted the author as an engineer and later as a patent attorney.

Not the least valuable part of the work are the charts which guide the reader into a simple understanding of the points in question. They show the factors governing the originality and ownership of inventions and the various requirements of patentability.

The author presents various diagrams in interpreting prior art which anticipates invention. The parties involved in the procedure are shown. The length of lines in the diagrams indicate the passage of time. In each diagram the length of time between actions is comparable to the length of the respective lines.

Interference procedures not only are explained in an understandable manner but are simplified by the citation of various examples.

If you want to learn how to write a good patent specification, to prepare amendments, to understand how an invention is clothed with the legal protection necessary to enhance its economic value—here is a book that will give you the required information authoritatively.

Riehle Testing Machine division, American Machine & Metals Inc., 100 Sixth avenue, New York, has established a Chicago sales office at the Pure Oil building, 35 East Wacker drive, in charge of F. J. Morris.

Castings Need Control

(*Concluded from page* 35)

quently the melting loss is excessive and in most instances varies within such wide limits that compensation for that loss is almost impossible to anticipate. Therefore, the resulting alloys, when analyzed, will vary within wide limits even though compensation for melting loss has been attempted.

If the melting practice is precise and uniform melting loss is likewise accurate, the amount that is lost in one charge gives the metallurgist the necessary information as to how much to add to the next charge to compensate for such melting loss. If the practice is so varied as to make it impossible for the metallurgist to determine what the melting loss is going to be, there is only one way to produce relatively accurate alloys.

That procedure is to melt the metal and produce the alloy, pour it into ingots, analyze the ingots and determine what the losses have been. Then calculate the necessary compensation required and remelt the ingots, bringing them just to the desired temperature as rapidly as possible. Add the necessary metal for compensation for loss, calculate a reasonable amount for loss in the melting of the ingots, and then pour this metal into the castings. Such a process should give a very high degree of accuracy in the alloy, but it does not necessarily insure the desired sound metal if gassing has occurred during the process of melting.

Develop Uniform Practice

It is true that gassed metal, when poured into ingots, will liberate much of its gas and thereby be made relatively gas free. That metal may be remelted under proper furnace conditions and produce sound metal of satisfactory quality. However, the best practice, is to take the necessary precautions to prevent gassing of the alloy at any stage in the melting process.

Develop as uniform a practice as possible in the melting room so that the alloy is exposed to furnace gases for a minimum length of time and is brought to the desired pouring temperature without delay. Then poured without any further delay. This will result in reducing the danger of gassing the alloy. Also it will result in uniformity of loss due to vaporization or oxidation that will enable those in control to make proper compensation for melting loss.

Many foundries attempt to correct bad melting practice by adding phosphor-copper or phosphor-tin to the ladle full of metal just before pouring into the mold. It has been stated frequently that a little phosphorus added at this time to many alloys will make them more fluid and they will run into the mold more sharply.

Standardize Alloy Additions

Such a practice may be standardized so that it becomes a part of the practice and is beneficial. Also it may be abused seriously resulting in an excessive amount of phosphorus in the casting. That condition causes a burnt-in skin on the casting and other difficulties that are peculiar to high phosphorus alloys. It also may change the percentages of tin, copper, or phosphorus in the resulting alloy so as to vary the percentage beyond the limits demanded by the specification.

Therefore, additions of phosphor-tin, or phosphor-copper, should be standardized thoroughly so that just the right amount is made available. In addition the time when these deoxidizers are to be added to the alloy should be standardized so that it becomes a part of the regular standard practice.

Some foundries actually effect a definite error in the analysis of their alloys by stirring the alloy with an iron rod and causing the alloy thereby to dissolve a certain amount of iron. Where the iron content must be held low, a graphite stirrer is much to be preferred or even a good piece of hard wood. If best results are to be secured this wood must be very dry. Graphite is much to be preferred over the wood.

Some foundries make the mistake of not stirring the alloys enough, resulting in an excessive percentage of the heavy elements in the bottom of the ladle and an absence of that element in the top. This provides a bad distribution of that element throughout the different parts of the casting poured from that ladle.

It will be seen from the foregoing remarks that there are a number of minor yet vital factors entering into the production of a first class, sound, satisfactory casting. Any one of those may give serious trouble and yet the molding, the core making, and the pouring may be entirely satisfactory. However, to have the most satisfactory castings each and all of the factors must be completely under control.

The mold must be rammed properly, made from the right grade of sand, bonded with a satisfactory amount of bond and possess a satisfactory minimum percentage of moisture. Cores must be set accurately, each held in place so that it cannot be moved by the pressure of the metal.

Gates must be provided so that the metal will enter the mold quietly and risers must insure proper feeding and be so located that the casting cools progressively; the first part cooled being that farthest from the riser and the last to cool being that just at the neck of the riser. The metal must be skimmed and poured carefully. The sprue must be kept full so that any dross developed during pouring will float on top of the sprue and not be sucked down into the mold.

The sprue should be such that it can be maintained at all times full and yet deliver a satisfactory amount of metal to the mold so that all parts may be run properly without developing cold shots or seams. The metal must be melted properly in an atmosphere made up of insoluble gases, or at least as high a percentage of insoluble gases as possible, which means that complete combustion of the fuel has taken place.

Given these conditions good, sound, satisfactory castings invariably will result. If perchance some particular defect is uncovered, the explanation of that defect is immediately determinable as all the necessary steps in the production of the casting have been standardized. Therefore, if it is blow holes, the blow holes must necessarily be the result of some particular condition at that point in the casting. If it is gas holes, it must be that the metal has been gassed in the process of melting, and if sand holes, it must mean that the sand has come from some point which can be readily located since that point from which the sand has been taken is filled with metal.

Book Review

Lange's Handbook of Chemistry, by N. A. Lange, fabrikoid, 1780 pages, 5¼ x 7¾ inches, published by Handbook Publishers Inc., Sandusky, Ohio, and supplied by THE FOUNDRY, Cleveland, for $6.00, and in Europe by the Penton Publishing Co., Ltd., London.

This is the second edition of the chemistry handbook, first published in September 1934. The present book has been revised to bring its subject matter up to date, and in addition has been enlarged to contain 237 pages more than the older edition. The present volume contains 16 new tables, and in addition 15 major revisions and 16 minor revisions have been made in tables presented previously. Data presented in this handbook cover an extremely wide range, and it is a valuable addition to the library of chemists, physicists, engineers, and manufacturers.

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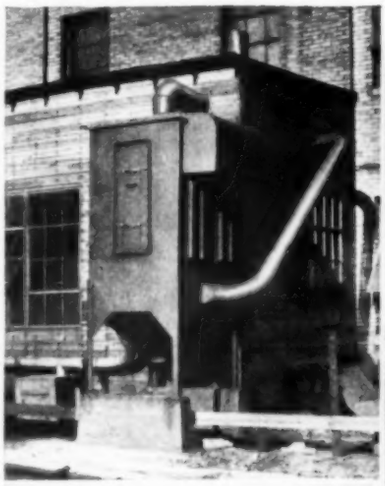

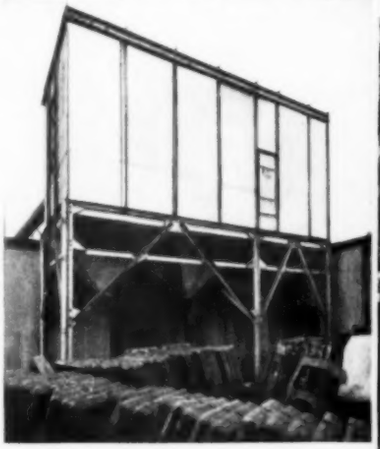

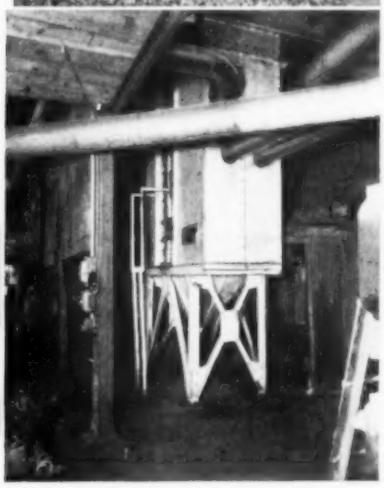

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Controls Sand Properties

(*Continued from page* 37)

content are eliminated. Fig. 1 shows the relation between the sand grain size and the base permeability, ranging from grains retained on the 20-mesh sieve to very fine material.

The 20-mesh material has a base permeability of 1796 and the pan material has a permeability of 6.9 while the diameter of the coarse grain is 15.5 times greater than the pan material. The base permeability increases very slowly from the pan material size to the 140 mesh size but a very rapid increase in permeability occurs as the size of the grains increase above 140 mesh.

Data on permeability control can only be secured by mixing two different sands, a fine sand and a coarse sand. Fig. 2 shows the difference in permeability due to the addition of various percentages of coarse and fine sand to a standard 70 mesh sand. Fig. 2 may be divided into two sections: 1. Coarse additions to the 70 mesh sand, and 2. Fine additions to the 70 mesh sand.

Fines Reduce Permeability

When the coarse sand is added to the 70 mesh sand the permeability does not increase until the coarse grains are in excess of 20 per cent. It will be noted from Fig. 2 that the permeability drops rapidly with the slightest addition of fines. For example a 10 per cent addition of fine sand will cause the permeability to drop from 200 to 100.

Fine sand has absolute control of permeability when it constitutes 70 per cent. The reason is that the fine material will lie in the void spaces between the large sand grains and reduce the gas passageways, and it is only after 30 per cent of coarse sand is added that the base sand begins to build the sand structure.

The question often arises whether a real coarse sand or a sand more nearly the size of production sand would prove most effective in opening up a sand. Permeability may be increased as effectively by sand of an adjacent sieve as well as a sand of a very coarse size when the coarse additions do not exceed 50 per cent; above this the coarse grain is more effective.

The type of bonding clay has an important influence on the permeability. It has been found that fireclay when gradually added to a sand will first absorb the fines up to a certain point depending on the quality of the clay, but after that point is reached the clay begins to fill in the voids in the same manner as fine silt and sand grains.

In the final analysis the condition of the sand in the mold is a real criterion of its fitness and to correlate casting defects with sand control figures we must be able to explain the action of the sand in the mold at elevated temperatures.

Just what happens when iron is poured into a mold? In less than 10 seconds the sand forming the mold cavity is heated to between 1800 to 2900 degrees Fahr. and that sand must be able to retain a perfect mold face up to the time that the molten metal solidifies or at least forms a thin skin.

Therefore, the mold must be designed properly and the sand must also be designed to withstand thermal shock. Recent data have shown that the mold properties at casting temperature may vary somewhat from that obtained at room temperature.

Mold Composition Varies

In molding sands we encounter various reactions due to the composition of the molds. First of all we have core sands using oil or cereal binders, brass and aluminum sands composed chiefly of grain and clay, gray iron sand composed of grain, clay and carbonaceous matter generally sea coal or pitch and steel sand containing grain, clay and cereal binders and it may be well to give a brief review of the reaction of each individual component under elevated temperatures before discussing their collective reactions.

Base of all good molding sand is quartz which may vary considerably in structure and in purity. When quartz is heated up to 1069 degrees Fahr. it changes its form from the alpha to the beta state. At this point an expansion takes place and may cause the grain to crack.

On further heating to temperatures between 2375 and 2800 degrees Fahr. we find that the greatest expansion takes place. During this time beta quartz is converted into trydimite. The change, however, takes place slowly at 2375 degrees Fahr. but at 2800 degrees Fahr. it may be completed in about an hour.

This is a permanent expansion and quartz in this form shows little or no change in size on heating to higher temperatures or cooling and reheating. This is the basis for the practice of burning new heaps and of using small proportions of new sand.

Clay exhibits two distinct shrinkage stages when heated. The first occurs at 220 degrees Fahr. when the surface moisture is driven off; the second shrinkage stage may begin at 850 degrees Fahr. but most generally range from 1100 to 1475 degrees Fahr. This is the stage at which the chemically combined water or the water of hydration is driven off. Temperature of dehydration will depend on the quality of the clay. The fusing point of clays of high iron content may be as low as 2700 degrees Fahr. and they sinter at 2190 degrees Fahr. Kaolin, 3200 to 2810 degrees Fahr.; bentonite, F. P. 2400.

Acts As Binder

Sea coal when heated above 700 degrees Fahr. softens and acts as a binder. At 840 degrees Fahr. distillation occurs with the evolution of large volumes of reducing gases. At this stage it flows freely in the pores of the sand. At 1450 to 1500 degrees Fahr. distillation is complete and coking occurs. During distillation the less volatile and pitchy constituents are redeposited in intergranular spaces by condensation.

To obtain some idea on the reaction of molding sand from the previous work on this subject let us attack this problem of elevated temperatures from four angles, namely: The effect of permeability; the effect of expansion and contraction; the effect of strength at high temperatures, and the effect of heat penetration.

Fig. 3 shows that as the temperature is increased the permeability is decreased definitely. The permeability is lower at high temperatures, not because the rate of flow of gases is reduced, but because there is more gas to get rid of due to the formation and expansion of gases from the molding material.

However, the foundryman should always keep a high initial permeability particularly when: The temperature of the metal is increased; the percentage of gas forming elements are increased; the pouring speed is greater, and the degree of artificial venting is less.

Breaks in the continuity of the curves are due to other gas forming substances such as moisture, oil binder, sea coal and cereal and the volume of these gases is increased by the heat of the metal which creates a large internal pressure in the mold.

High permeability favors the escape of gas but heads, vents and risers relieve the pressure completely. Low permeability will result in trapped gases which cause

(*Concluded on page* 83)

(*Concluded from page* 80)

blows and pin-holes. The rate at which the heat travels through the mass of sand will depend upon the permeability.

The degree of expansion and contraction varies according to the nature of the sand and depends largely on the molding materials added to it. Fig. 4 shows the expansion and contraction of sand at elevated temperatures. When ordinary molding sand containing grain and clay is heated to 212 degrees Fahr. the moisture is driven off; at 1069 degrees Fahr. a definite but moderate expansion occurs quickly compensated by a contraction of the clay at 1250 to 1400 degrees Fahr. Under 2375 degrees Fahr. only a slight change in size results.

Some low fusion point sands tend to glaze the mold surface below the temperature and thereby minimize the possibility of defects. This type of sand is satisfactory in light casting manufacture but does not work well with heavy sections.

Iron foundry sands are usually composed of grain, clay and sea coal and the reaction on heating is such that at 212 degrees Fahr. the free moisture is driven out, at 700 degrees Fahr. and above the sea coal softens and flows compensating for drying shrinkage and at the same time bonding the grains.

Sea Coal Becomes Soft

As the temperature rises to 860 degrees Fahr. the volatile matter is driven off. Up to 1069 degrees Fahr. active silica expansion occurs but during this time the sea coal has softened to allow expansion of the grain and to prevent mold surface deformation. The volatile matter condenses on the cooler grains and at 1250 degrees Fahr. the dehydration of the clay is actually shrinking the mold surface while sea coal at this time acts sluggishly and forms a sticky pitch which prevents surface deformation. Above 1500 degrees Fahr. the coal cokes, compensating for clay shrinkage.

When the temperature rises to 2375 degrees Fahr. the grain expands but the coke undergoes a radical shrinkage retaining the rapidly expanding silica grains in a solid nonmoving mass. During this instant coal is deposited on the mold surface and a layer of carbon prevents adhesion of sand and clay to the solidifying metal. Therefore, it compensates for normal expansion and contraction of sand and clay. On rising temperatures sea coal increases erosion resistance by lowering the expansion and contraction.

Some of the defects caused by the expansion and contraction are: Cracks—caused by a large contraction; buckling—occurs when one part of the casting is heated to a higher temperature than another so that the degree of expansion will vary in different sections of the mold; rat tail—which is really a fracture of the mold and occurs in the light weight castings where the temperature of the sand does not reach the contraction point but where the heat is sufficient to expand the sand, and scabs may occur when backing sand behind facing is at a lower temperature and will be expanding while the facing sand is contracting. This tends to force the facing sand into the molten metal. It is therefore, desirable that the facing sand heat up uniformly.

Increase Sand Strength

The mold must be sufficiently strong to retain its size and form with minimum distortion in order to prevent erosion from the flowing of hot metal and to permit the easy removal of the sand after casting. Fig. 5 shows that the strength is increased to a marked degree up to 1660 degrees Fahr. and then a decrease occurs. Up to 1660 degrees Fahr. the sand specimen breaks suddenly but at higher temperatures they bulge due to a softening of the refractory. Up to 1840 degrees Fahr. coal dust prevents softening under load and also prevents large increases in strength as the temperature of the sand rises. Sand bonded with oil goes rapidly to nil at 750 degrees Fahr.

In many cases sands having the greatest expansion also have the highest strength. Many of the very high strength sands are dangerous and are probably responsible for a large percentage of casting defects.

The ease at which sand can be removed from castings after cooling is important because this effects the shake-out cost. It will be noted in Fig. 6 that the sand does not materially increase in strength when heated to elevated temperatures and cooled to room temperatures. Coal dust plays a very important part in preventing sand grains from sticking together and promotes easy removal of the sand from the casting.

We must always keep in mind that mold conditions at elevated temperatures also depend on heat penetration, and to co-ordinate these results to any practical problem we must know the heat penetration of the mold.

Woodflour sometimes is used to replace sea coal and we find that it acts similarly to sea coal except that it decreases the green compression and dry compression strength. On the other hand it increases the permeability in both the green and dry state. Therefore, while it decreases dry strength it produces a much more permeable sand. The lower strength in sand containing woodflour may be compensated by the addition of more bond, yet its permeability still will be greater than the sand containing sea coal.

Its action at high temperatures is similar to that of sea coal but it reduces the expansion to a greater degree even in heavily bonded sand and it can be said that saw dust additions impart better high temperature characteristics than sea coal. On the other hand blacking or crushed coke does not produce the same effect as sea coal or wood flour at elevated temperatures due to the absence of volatile matter which appears to be essential. The physical properties of a mold must be satisfactory not only at atmospheric temperatures but at elevated temperatures as well, and it is only through adequate control and careful supervision that molding can be changed from an art to a science.

Book Review

Directory of Iron and Steel Plants, 1938, flexible cover, 452 pages, published by Steel Publications Inc., Pittsburgh, and supplied by THE FOUNDRY, Cleveland, for $10.00 and in Europe by the Penton Publishing Co. Ltd., London.

This is the annual directory listing companies and officials operating blast furnaces, steel plants, rolling mills, by-product coking plants, boiler and tank shops in the United States and Canada.

It lists these companies both alphabetically and geographically, and for each company is given officials, when available, from chairman through to the purchasing agent and such plant officials as superintendent, safety engineer, chief electrician, storekeeper, and yard superintendent.

Sales Conference

Second annual sales convention of Frederic B. Stevens Inc., was held at the Hotel Statler, Detroit, Dec. 29 and 30. Approximately 40 salesmen from various sections of the country were present. The banquet, attended by all representatives and the complete office staff, was presided over by W. Joseph Cluff, president. The speakers included M. W. Bingay, managing editor of the Detroit Free Press and James F. Hughes, ex-congressman from Wisconsin. H. G. Weaver, General Motors Corp., spoke at the luncheon on the second day of the conference.

Walking backward with loads is a dangerous practice, and it is particularly so in restricted areas.

OBITUARY

JOHN A. CAPP, 67, engineer of materials in the General Electric Works laboratory, Schenectady, N. Y., died Jan. 6 after a short illness. Mr. Capp was born in Philadelphia in 1870 and as a student at Central high school, was a pupil of the late Professor Elihu Thomson, with whom he was later associated in the Thomson-Houston Co., a predecessor of the General Electric Co., at Lynn, Mass. Mr. Capp was graduated from the University of Pennsylvania in 1891 and after a short time at Lynn, was sent to Schenectady. He formed the testing laboratory and was its head until it was merged with the Schenectady Works Laboratory in 1927. During his service with the company he specialized in the study of many types of materials entering into the construction of electric equipment. As a charter member of the American Society for Testing Materials he has been active in its work since 1898. He was president in 1918 and 1919, and last year was elected an honorary life member of the organization. Mr. Capp was a member of the American Foundrymen's association and for many years was active in the American Society for Metals.

♦ ♦ ♦

Thomas H. Doyle, 58, sales director, Sharon, Pa. plant of the National Malleable & Steel Castings Co., died in Sharon on Jan. 4.

♦ ♦ ♦

Frank W. King, 65, formerly associated with the Valley Mold & Iron Co., Hubbard, O., died unexpectedly at his home in Sebring, Fla. recently.

♦ ♦ ♦

Frederick J. Reibel, 58, for many years associated with the Standard Sanitary Mfg. Co., Pittsburgh, died in that city Jan. 4. He had served in executive capacities in the purchasing department of that organization until his retirement 10 years ago.

♦ ♦ ♦

W. S. Rowan, recently foundry superintendent of Auburn Foundry, Inc., Auburn, Ind., died at his home in Auburn, Jan. 11. Mr. Rowan had been associated with the company for many years, previously having been identified with the Gale Mfg. Co., Albion, Mich.

♦ ♦ ♦

James S. Phifer, 68, for the past 27 years superintendent of the Allentown, Pa. plant of the American Steel & Wire Co., died recently. Mr. Phifer had served 4 years with the Coleraine Iron Co., Reddington, Pa. as machinist and 3 years as machinist and foreman, Bethlehem Foundry & Machine Co., Bethlehem, Pa. before becoming associated with the American Steel & Wire Co.

♦ ♦ ♦

George W. Gilderman, 62, Indianapolis, died recently. Mr. Gilderman was born in Indianapolis, where he first worked as a molder. He was later made foundry superintendent of the Clarage Co., Kalamazoo, Mich., and not long after became foundry superintendent of Advance Rumely Co., La Porte, Ind. Leaving there, he went to the Dodge Mfg. Co., Mishawaka, Ind., where he remained for several years. Mr. Gilderman, who had an interest in foundry matters all over Indiana, was at one time a lecturer at Purdue university and a familiar figure at the conventions of the American Foundrymen's association. Ill health forced his retirement 3 years ago.

♦ ♦ ♦

George W. Smith, 76, president and general manager of the Sterling Steel Foundry Co., Braddock, Pa., died Jan. 4 at his home in Tarentum, Pa. Mr. Smith entered the steel foundry business in 1902 with his brother, the late C. C. Smith, president of the Union Steel Castings Co., Pittsburgh, but severed his connections with that organization in 1911 when he purchased the Sterling Steel Foundry Co., which he headed from that time until his death. Mr. Smith took an active part in civic affairs and was prominent in banking circles, having acted as president and chairman of the board of the First National Bank of Tarentum.

Discusses Design of Steel Castings

A 62-page booklet entitled "The Influence of Design on Stress Resistance of Steel Castings" by the late R. A. Bull, has been published by the American Foundrymen's association. The information presented should be useful to both manufacturers and users of steel castings.

A special committee on steel casting design, composed of the following, co-operated in the preparation of the material: Chairman, John H. Locke, General Steel Castings Corp., Eddystone, Pa.; Fred Grotts, Lebanon Steel Foundry, Lebanon, Pa.; P. E. McKinney, Bethlehem Steel Co., Bethlehem, Pa.; and L. C. Wilson, Reading Steel Casting Co., division of American Chain & Cable Co., Reading, Pa.

Copies of this information booklet "Influence of Design on Stress Resistance of Steel Castings" may be ordered from the office of the publisher, the American Foundrymen's association, 222 W. Adams street, Chicago.

Gives Results of Personnel Study

Policyholders service bureau, Metropolitan Life Insurance Co., New York, has just completed a study of the organization and functions of the personnel department and has published a report of the findings entitled, "Functions of the Personnel Director." It is based on information obtained from 80 companies in varied industrial and commercial fields. In addition to outlining and interpreting the personnel functions, the study describes the personnel programs of the contributing companies, discusses the place of the personnel director in the business organization and tells how personnel departments are organized.

Eye Hazards

National Society for the Prevention of Blindness has reissued its book on "Eye Hazards in Industrial Occupations" by Louis Resnick and Lewis H. Carris. Although it was first published in 1924 and some of its illustrations show safety devices which have since been improved upon, the contents remain a valuable guide to safe practice in industry. Copies may be secured from the offices of the society, 50 West Fiftieth street, New York, at the reduced price of 50 cents each.

Publishes Report

Machinery & Allied Products institute, Chicago, has published a report of a study on "Federal Control of Wages and Hours" in which it says that threats of wage and hour legislation have intensified the uncertainty which is largely responsible for the current recession, and have retarded rapid industrial recovery. Copies of the report may be secured from the offices of the institute, 221 North La Salle street, Chicago.

Is Representative

John G. Kelly Inc., 210 East Forty-fifth street, New York, has been made representative of the Roots-Connersville Blower Corp., Connersville, Ind., for the sale of boiler service units, and Frank A. Kristal, 30 Church street, New York, will represent the company in the sale of turbine pumps for industrial applications.

Bulky materials which are handled by hand, should be tipped carefully to a balance and secure handholds obtained before any attempt is made to lift or to move.

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No. 131 Jolt Squeezer, with 13" squeezing piston. No. 181 size with 18" squeezing piston, also available.

No. 143 Jolt Squeezing Stripper with 14" squeezing piston. No. 163 size with 16" squeezing piston, also available.

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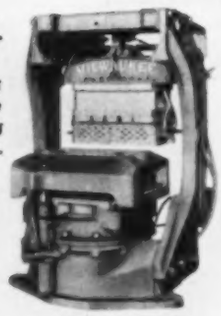
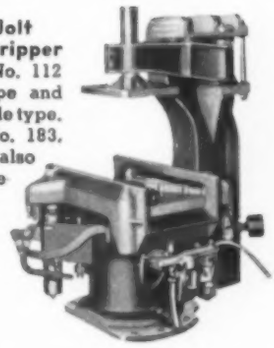


No. 142 Jolt Squeezing Stripper 14" piston. No. 112 stationary type and No.113 portable type. 11" piston. No. 183, 18" piston, also available



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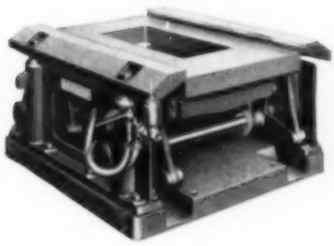

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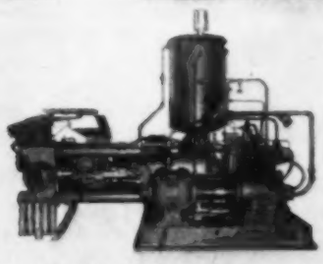

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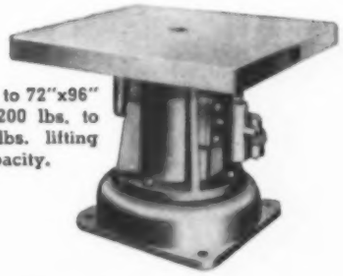

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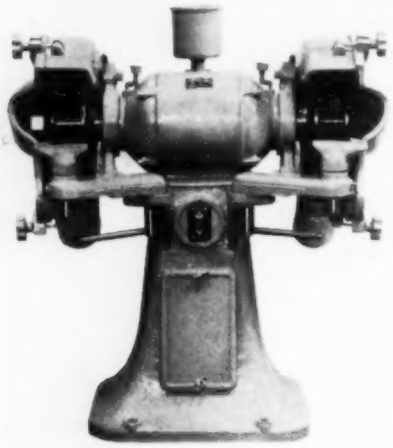
New Equipment for Foundries

Floor Grinder

Jas. Clarke Jr. Electric Co., Louisville, Ky., now has on the market a narrow base grinder, shown in the accompanying illustration, especially designed for all classes of heavy production grinding. The motor is totally enclosed. The alloy steel rotor shaft is mounted in heavy duty antifriction bearings, grease lubricated and sealed in special housings. The motor is rated 5 horsepower for continuous duty at 1150 revolutions per minute with a temperature rise of 55 degrees Cent.



Narrow base grinder especially designed for heavy production

The motor will stand a momentary overload of 100 per cent. Tool rests are mounted on the grinder pedestal. The motor is wound for 220/440 volts, 50-60 cycles, 3 phase alternating current. Motor can be wound for 550 volts, 3 phase alternating current and odd cycles.

The grinder is equipped with a magnetic starter having overload and low voltage protection, enclosed safety guards with hinged covers. Guards are adjustable for wheel wear. Equipment includes safety glass eye shields, tool rests for horizontal and vertical adjustment and water pot mounted on top of motor frame. Wheel guards are equipped with exhaust connection openings in bottom. Grinding wheels are not included.

Protective Clothing

Davis Emergency Equipment Co. Inc., Graybar building, New York, has added a new line of protective clothing for either acetylene or arc welding. This includes goggles, sleeves, aprons, leggings, spats and gloves for acetylene welding and helmets, hand shields, sleeves, aprons, coats, pants, leggings, spats and gloves for arc welding. Goggles, helmets and hand shields are equipped with glasses of various shades, each suitable for a special type of work. Five different shades of goggles range in use from light brazing to heavy welding, and three different shades of glasses for helmets and hand shields are for light and heavy metallic electrode work and for carbon arc work respectively.

It is claimed the garments for use in arc welding protect the body from the effects of ultra-violet light as well as from the heat and sparks.

Friction Clutch

T. B. Wood's Sons Co., Chambersburg, Pa., recently has added a new design clutch to its line of friction clutches. In the new clutch, the disks are driven by steel pins which are cushioned by rubber bushings with special self-lubricating bronze bushings in the rubber. The friction disks are fitted with nonburn lining. The clutch is designed for drivers where heavy impact is encountered on either end. It is claimed that use of the rubber and bronze bushings eliminates knocks, absorbs shock, and adds to the life of the clutch. It also is said that the clutch is safe, dependable and compact, and will not kick out when engaged or pick up when disengaged.

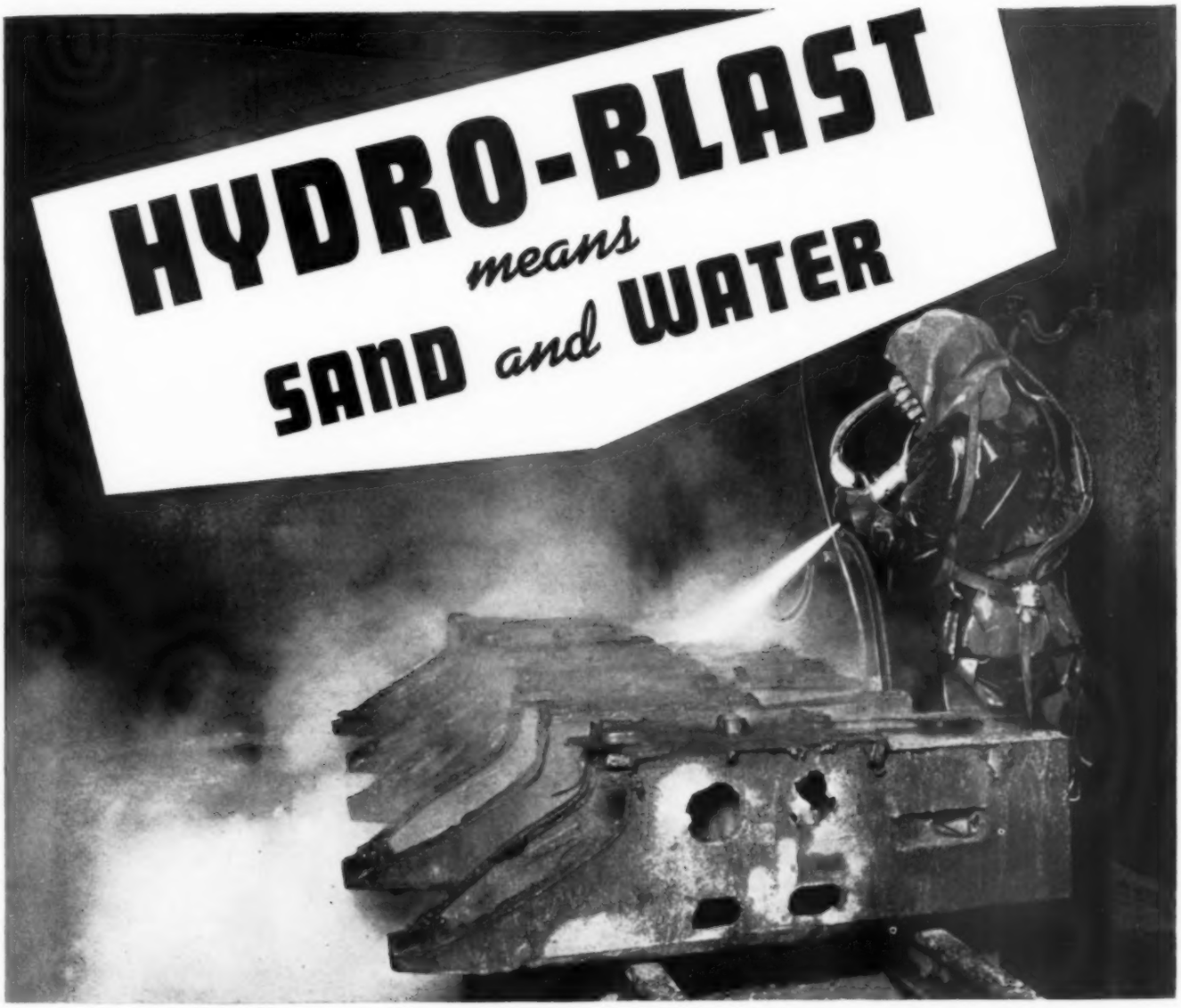
Hardness Testing

Herman A. Holz, 167 East Thirty-third street, New York, is marketing a new Vickers-Amsler hardness testing machine which is shown in the accompanying illustration. It is designed for precise laboratory work in determining hardness of hard, thin metals or of case hardened, nitrided and similarly treated sections. The machine is constructed without a lever system, and employs direct or dead-weight loading. Either the Vickers' diamond pyramid or brinell balls 1, 2 and 2½ millimeters in diameter may be used.

Maximum load that can be applied is 62½ kilograms. Maximum distance from indenter to specimen support plate is 12 inches, and from indenter to machine frame is 6 inches. Load is applied through an oil dash contained in the hollow main column of the machine, and after a definite period the load is lifted. The period of the test cycle is adjustable. As soon as the load is lifted automatically, the indentation is ready for measurement with the

Hardness testing machine is designed for accurate measurements employing either a pyramid diamond or steel balls

(*Continued on page* 89)



THE HYDRO-BLAST SYSTEM

for cleaning castings should not be confused with previous ineffectual attempts to adopt hydraulic principles to foundry needs . . . The application of water alone is but a step in the right direction. The inclusion of sand and its expulsion with the water at high pressures gives Hydro-Blast cleaning efficiencies that have never before been attained . . . Add to Hydro-Blast's casting cleaning economies the absence of need for special dust arresting and dust collecting auxiliaries and you have today's most efficient castings cleaning system . . . Remember — Hydro-Blast creates no dust.

Upon request, you will receive complete information without cost or obligation.

HYDRO-BLAST Corporation
111 W. WASHINGTON ST., CHICAGO, ILL.

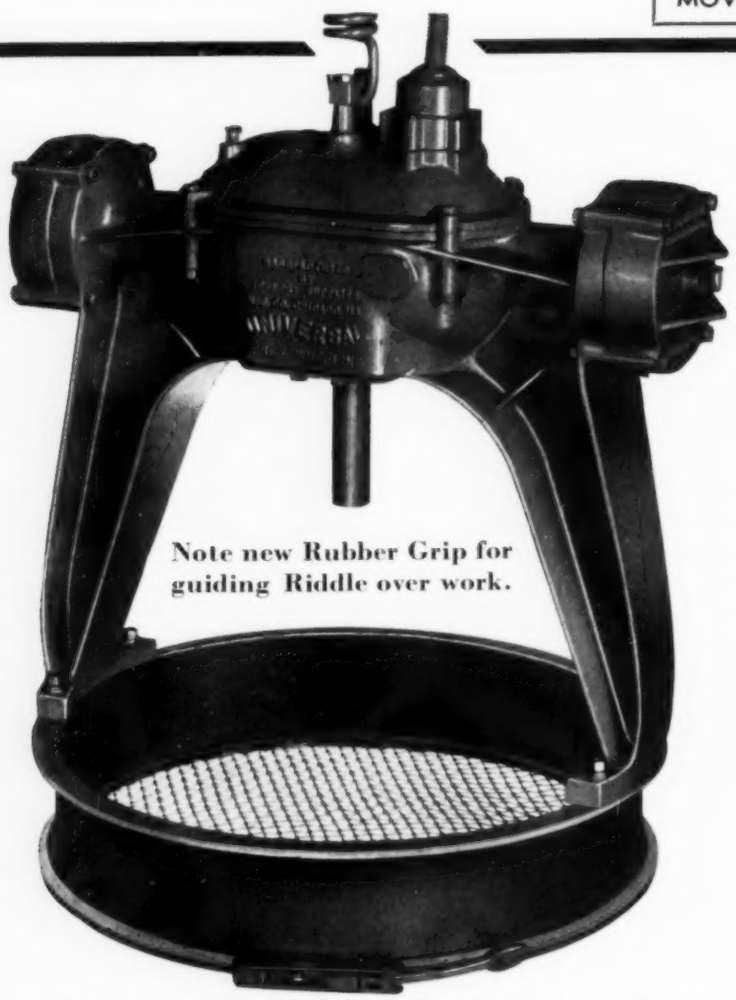
Free Wheeling

FASTER THAN EVER

with the DOUBLE EIGHT VIBRATION MOVEMENT

RIDDLE

UNEQUALED IN CAPACITY PER HOUR



Note new Rubber Grip for guiding Riddle over work.

ITS USEFULNESS HAS NO LIMIT

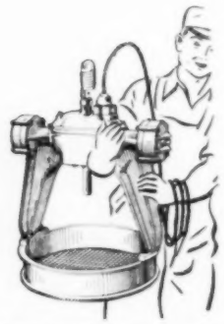
A Universal Portable Riddle YOUR plant needs. Amazingly fast—amazingly efficient—quickly pays for itself in any foundry. Unique "Free Wheeling" principle eliminates excessive bearing wear, insures smooth free operation and *much faster action*. One man *actually can* handle it easily—weighs only 70 lbs. Hooks up anywhere, quickly tilted and dumped in place—overall height only 28½ inches. Exclusive Double-8 vibration movement breaks up sand lumps as it sieves. *All* mechanism completely dustproof. Operating cost ridiculously low.

New Exclusive Feature! Sieves now mounted in steel ferrule, quickly clamped onto all-steel split-ring bottom. No jagged edges, no more breakable wooden rims, no storage problem, no waste space. Sieves are instantly interchangeable.

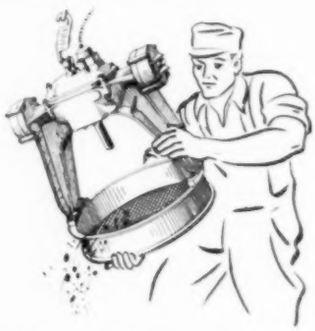
TEN DAYS FREE TRIAL **$150.00** f.o.b. Chicago—115 and 230 volt AC single phase, 60 cycles. DC motors $7.50 extra. 3-phase (4 wire grounded cable) $10.00 extra.

Foundry Supplies Mfg. Co.

2221 ORCHARD ST. CHICAGO, ILL.



EASY TO HANDLE—Can be carried from point to point by one man and hooked up anywhere.



QUICKLY DUMPED—Easily tilted and dumped without being unhooked . . . overall height only 28½ inches.

NEW TYPE SIEVES—Mounted in strong steel ferrules; 20 inch diam. clear sifting area. Extra sieves 2-6 mesh. $1.35.

A very useful jib crane mounting (blueprints free on request), showing use of the new rubber grip for guiding over work.

(*Continued from page* 86)
attached microscope. The latter is mounted on a special support so that it may be moved through 90 degrees between two stops. Microscope is provided with cross hair and micrometer drum reading directly to 0.001 millimeter. Swinging the microscope through 90 degrees permits impressions to be measured across two intersections.

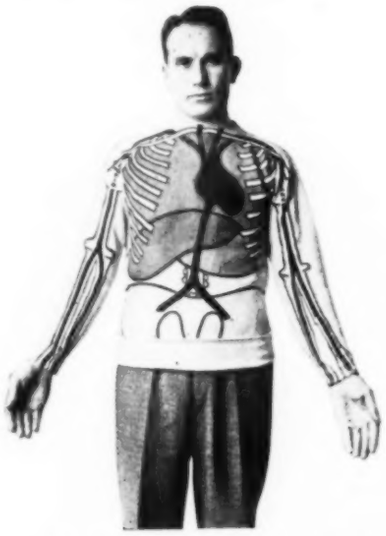
Magnetic Clutch Has New Lock Design

Automatic self-alignment at all times is a feature of the new magnetic clutch developed by the Stearns Magnetic Mfg. Co., Milwaukee. The unit is claimed to be adaptable for universal wet or dry applications. Absence of push rods through the principle of the floating clutch cage is said to allow greater freedom of action and avoids binding in the friction elements.

A simplified latch and groove lock design provides adjustment in a few moments with no tools necessary. This is accomplished by depressing the latch, indicated by an arrow, and turning the armature member to the next notch, thus restoring the original air gap. Replacement of linings is comparatively easy.

Shows Anatomy

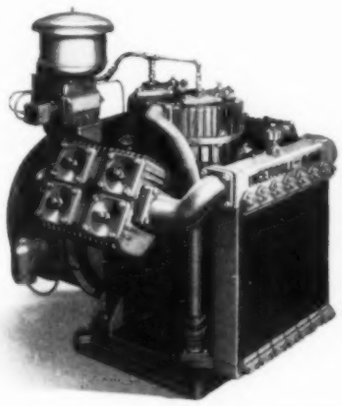
Mine Safety Appliances Co., Pittsburgh, recently has placed on the market a garment known as an anatomical shirt which can be applied for practical and graphic instruction in the location of arteries, bones and organs of the torso, and arms. It is claimed that the anatomical shirt is true to life, and provides a striking picture of physical features constantly referred to in instruction, and is essential to a working knowledge of first aid.



Anatomical shirt shows location of arteries, bones and organs of the torso

Motor Compressor

The motor compressor recently introduced by the Ingersoll-Rand Co., Phillipsburg, N. J., and shown in the accompanying illustration, is a stationary, vertical, single acting two stage compressor in which the intercooler and radially placed cylinders are air cooled. Motor and compressor form a single compact unit. The compressor crankshaft carries the motor rotor and the compressor frame carries the motor stator. Flexible coupling and V-belt drives also are available. Sizes range from 15 to 75 horsepower for discharge pressures from 80 to 125 pounds per square inch. Piston displacements range from 79 to 445 cubic feet per minute.



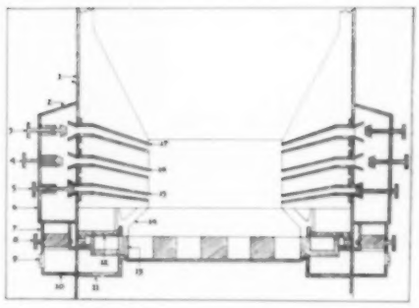
Air cooled motor compressor is compact unit

Tool Retainer

Hammond Machinery Builders Inc., Kalamazoo, Mich., has developed two new disk grinders for 18 or 20 inch disk. The spindle is 29 inches long overall mounted on four roller bearings. Size of the base at the floor is 24 x 24 inches and the rocker shaft measures 2½ x 58 inches. The spindle is driven either by a 5 or 7½ horsepower motor and a multiple V-belt drive is employed. Universal lever feed tables measure 6 x 11 inches.

Improved Tuyere

Ease of installation, efficient operation and reduction in melting cost are claimed for the tuyere construction shown in the accompanying illustration and patented by F. J. Zippler, 608 Throp Street, Pittsburgh. Adjustment of blast pressure and volume to meet varying conditions is secured through the plungers 3, 4 and 5 in the upper wind belt and through the damper 8 in the connection between the upper and lower wind belt. Numbered features in the illustration include:



Temporary or permanent balanced blast is maintained through adjustment of upper plungers and lower dampers

1, cupola shell; 2, wind belt; 3, 4 and 5, sliding plungers for opening and closing upper tuyeres; 6, lower part of wind belt; blast pipe between upper and lower wind belts; 8, damper held in any desired position by ratchet; 9, peep hole and door; 10, fusible plug; 11, lower flanged tuyere ring; 12, upper tuyere ring; 13, main tuyere blocks; 14, metallic bosh blocks coated with refractory material; 15, 16 and 17, upper tuyeres.

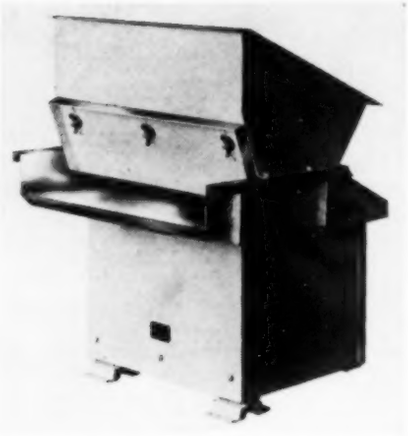
Truck Controller

Baker-Raulang Co. Cleveland, has developed a new controller for industrial trucks. It is claimed that the truck cannot be started from a dead stop while in third speed, or reverse from full speed ahead without stopping the motion of the truck. Also, it is said that starting overloads are prevented by requiring the operator to start in first speed and to employ the acceleration speeds which are provided.

The new controller is a metal drum, continuous torque type which provides three speeds forward and reverse. It is interlocked with the brake through a magnetic blowout, mill-type contactor in such a manner that when the operator steps off the truck, the circuit is broken and the brake is set.

Vibrating Feeder

Syntron Co., 540 Lexington avenue, Homer City, Pa., recently has placed on the market a specially constructed vibratory feeder, shown in the accompanying illustration, for feeding small objects onto a wide moving inspection belt. The feeder has a wide, short trough under a receiving hopper provided with an adjustable gate. Movement of the material in a wide single layer is by vibration. The material spreads out on the belt in an evenly spaced manner thus facilitating the work of the inspector in spotting defective, odd size or foreign objects. Speed of flow is controlled by a rheostat in a separate wall mounted controller supplied with the feeder.



Adjustable gate regulates flow of material from the hopper

The machine is driven from the ordinary 110 volt, alternating current.

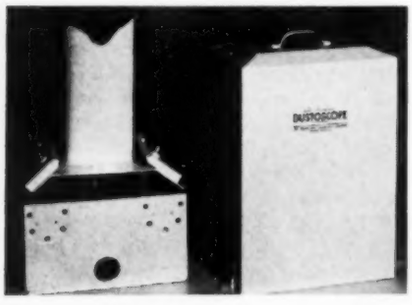
Prevents Freezing

An additional and improved system of air line and air tool freeze preventative is being marketed by the Sullivan Machinery Co., Michigan City, Ind. It has been developed particularly for industrial applications and wherever electric current is available for its operation. In operation, the freeze preventative is vaporized in a vaporizer and is fed into the compressed air line near the compressor as fast as necessary to prevent freezing of water vapor in compressed air lines and tools.

This system is claimed to be effective and economical—current consumption is small and thermostatically controlled, and only about a quart of the liquid is required to treat 100,000 cubic feet of free air under the worst conditions of temperature and humidity.

Dust Estimator

Service To Industry, West Hartford, Conn., is marketing a device for direct examination of dust in a continuous sample of air. The instrument, which is shown in the accompanying illustration, was developed in the chemical engineering laboratories of the Travelers Insurance Co., Hartford, Conn. It is claimed that with the device, particles as small as 0.5-micron easily are visible. Average clean office air containing from 500,000 to 1,500,000 particles per cubic foot may be used as the base for estimation. Neither microscope nor laboratory apparatus is necessary.

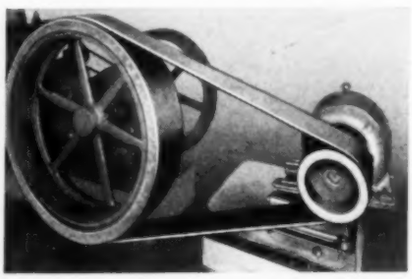


Dust estimator permits direct viewing of the dust contained in a constant stream

Numerous advantages claimed for the instrument include: Dust is seen directly in the air, large amount of air may be examined quickly, examination may be for as long a period as desired, different locations may be examined at practically the same time, operates equally well on any kind of dust, no special technique required, etc.

Fiber Lagging

Rockwood Mfg. Co., Indianapolis, has developed a new fiber lagging, shown in the accompanying illustration, and designed to increase the diameter of pulleys and flywheels. It is pointed out that



Lagging on fly wheel increases capacity

increasing the diameter of the driven pulley permits increasing the size of the motor pulley and results in higher belt speed. A slightly slacker belt increases the belt life and reduces belt maintenance. The laggings are supplied in any width and up to 72 inches in diameter. They are applied to the wheel rims with a simplified clamp. Once installed, it is claimed they do not require replacement and retain high belt gripping capacity indefinitely.

Electric Drill

Black & Decker Mfg. Co., Towson, Md., has developed a new lightweight, ball bearing electric drill which is said to combine ample power, compact design, and ability to work around corners. The drill, which is shown in the accompanying illustration, is made in 3/16-inch and ¼-inch sizes, and the chuck spindle is mounted at right angles to the motor. The overall working length of the unit is 4½ inches. Motor housing dimensions have been reduced so that the tool fits snugly in the operators' hand, and

Light weight drill has chuck mounted at right angles to the motor

requires no extra handle. The ventilating arrangement consists of deep vents cast in the gear head which are claimed to provide for free passage of air even though the tool is grasped by the head. The tapered end of the gear-head extends over the chuck protecting the operator's fingers. The unit is ball-bearing equipped, and has a universal motor.

Magnetic Filter

Ferro Enamel Corp., Cleveland, has the exclusive handling in the porcelain enameling industry of a new type magnetic separator made by the Stearns Magnetic Mfg. Co., Milwaukee. The unit is available in five sizes operating on any direct current voltage. It is claimed the new type separator has twice the collecting area heretofore available. Instead of the usual magnets and screen cartridge, the new model has a series of highly magnetized screens through which the liquid is filtered through more than 21,000 lineal feet of active collecting edge. To prevent contamination the coil windings are enclosed completely in a machined cavity and sealed with a special moisture resisting material. Should current be interrupted a direct acting check valve prevents any liquid from filtering through. The screen easily may be removed for cleaning and the absence of dirt catching cavities makes cleaning a simple operation.

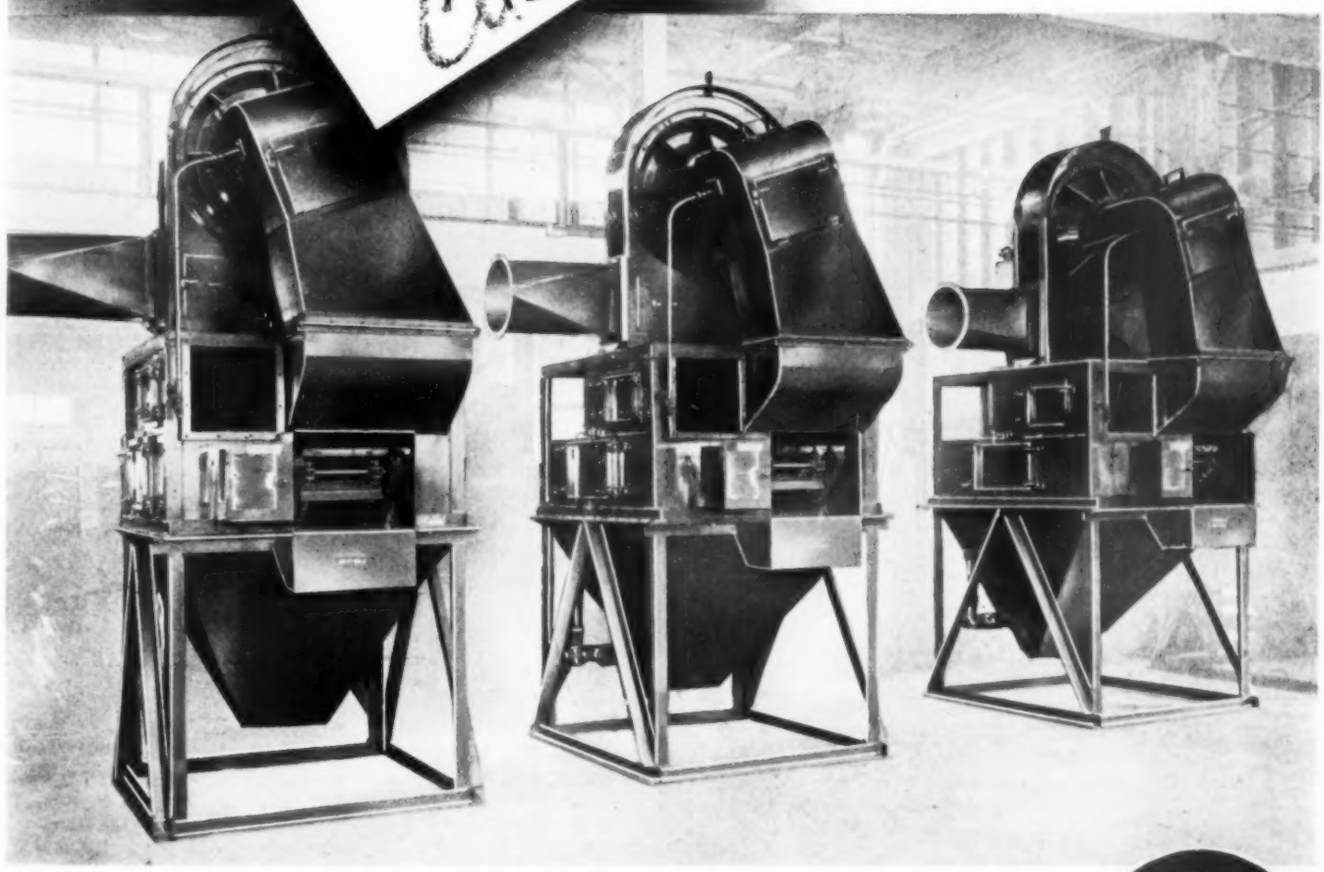
Flux for Tinning

American Solder Flux Co., Waynue Avenue & Berkley Street, Philadelphia, has developed a new tinning flux which may be employed as dipping flux as well as a top cover for the surface of tin bath employed in the tinning of castings or sheet steel. The flux is available in liquid form, and has a specific gravity of approximately 50 degrees Baume. It is claimed that use of the flux results in a lighter, smoother and more uniform tin surface, and in many cases completely eliminates objectionable and costly re-dipping.

The TYPE W ROTO - CLONE handles every foundry dust problem . . .

SHAKEOUT . . SAND HANDLING . .
CONDITIONING . . SCREENS . .
MULLERS . . TUMBLING MILLS . .
SAND BLAST . . GRINDERS

Write for Engineering data



AMERICAN AIR FILTER CO., INC., *Incorporated*
116 Central Ave., Louisville, Ky.
In Canada: Darling Bros., Ltd., Montreal, P. Q.

ROTO-CLONE TYPE W
WATER SPRAY DYNAMIC PRECIPITATOR

Scrap Handling

Owen Bucket Co., Breakwater avenue, Cleveland, recently has introduced a new type of grapple for handling scrap iron. In closing, the

The tine encountering the least resistance penetrates furthest

tine which encounters the least resistance, penetrates deeply into the material and anchors. The other three tines follow in the same order with a powerful gathering, closing action like that of a giant hand. Small scrap, bushelings and stove plate are picked up in grabs so large that the grapple is far from closed and there still is no spillage after the grapple has compressed the material between its tines, it is claimed.

It is pointed out the independent operation of the tines enables the grapple to penetrate various kinds of scrap and to gather and lift large capacity grabs.

9-Inch Lathe

South Bend Lathe Works, South Bend, Ind., has developed a 9-inch lathe with a 1⅜-inch hole through the spindle and 1-inch collet capacity. Developed for manufacturing plants and tool room use, the new lathe is back-geared, screw-cutting, with many engine lathe features. A six tool bed turret and double tool slide adapt the lathe to handling multiple operation manufacturing work; telescopic taper attachments permit doing prices taper work; other attachments include electric grinders, chip pans, collet trays, carriage stops, and milling and keyway cutting attachments.

Projection Heater

Trane Co., La Crosse, Wis., recently has developed a new multiple projection unit heater, which is said to combine the lightness, flexibility, and compactness of the propeller type unit heater with the long range delivery and large capacity of larger blower type heaters. It is a high velocity, multiple fan unit with each fan under individual control, primarily designed and intended for use where a maximum of space must be heated with a minimum of units.

It utilizes a new means for both diffusing the air stream and carrying it a considerable distance at the same time. Into this ceiling mounted unit, the warm air is drawn through the two coils and then projected straight downward in a vertical stream. As this air stream enlarges it induces a large amount of room air which both gives it volume and so reduces its velocity that it reaches the floor evenly.

The motors are mounted out of the path of the air on a resilient construction. Two extended surface coils are contained within a metal casing. A four-blade propeller fan, especially designed for quiet operation, is employed.

Screw Cuts Thread

Shakeproof Lock Washer Co., Chicago, has developed a screw that cuts its own thread in metals and plastics of practically any thickness.

The screw contains a slot which cuts the thread, and eliminates a tapping operation

As shown in the accompanying illustration the screw contains a thread-cutting slot which plus a special hardening process, eliminates a separate tapping operation required with ordinary machine screws. Since the screw remains in the threads it has cut, it is claimed that a better fastening results. If it is necessary to replace the screw, an ordinary machine screw of the same size will fit the threads which have been cut in the material.

Drain Pipe Cleaner

Parker S. Atwood, 6 Bradley Avenue, East Haven, Conn., is marketing a device for opening clogged pipes. The device operates on a hydraulic-pneumatic principle in that the clogged drain line or pipe is filled with water, and the device containing a pump supplies compressed air.

In operation the device, with the proper adapter to seal the outlet, is held firmly in place while the trigger is released quickly. A sudden shot of compressed air from 15-150 pounds per square inch hits the built up column of water, and is claimed to remove the stoppage without damaging pipes or traps. The complete device includes five nozzle plugs for drain openings from one-fourth inch to two and one-half inches; six expansion plugs and two adapters.

Sandblast Hose

A new construction of sandblast hose designed to overcome the accumulation of static has been introduced by the B. F. Goodrich Co., Akron, O. Although the hose does not eliminate static, it does provide a ground wire in the heart of the hose wall so that discharges of static tend to ground through the wire rather than through the body of the operator. Static punctures, instead of penetrating entirely through the hose wall, with disastrous results, reach only as far as the wire, permitting the hose to continue in service with little damage.

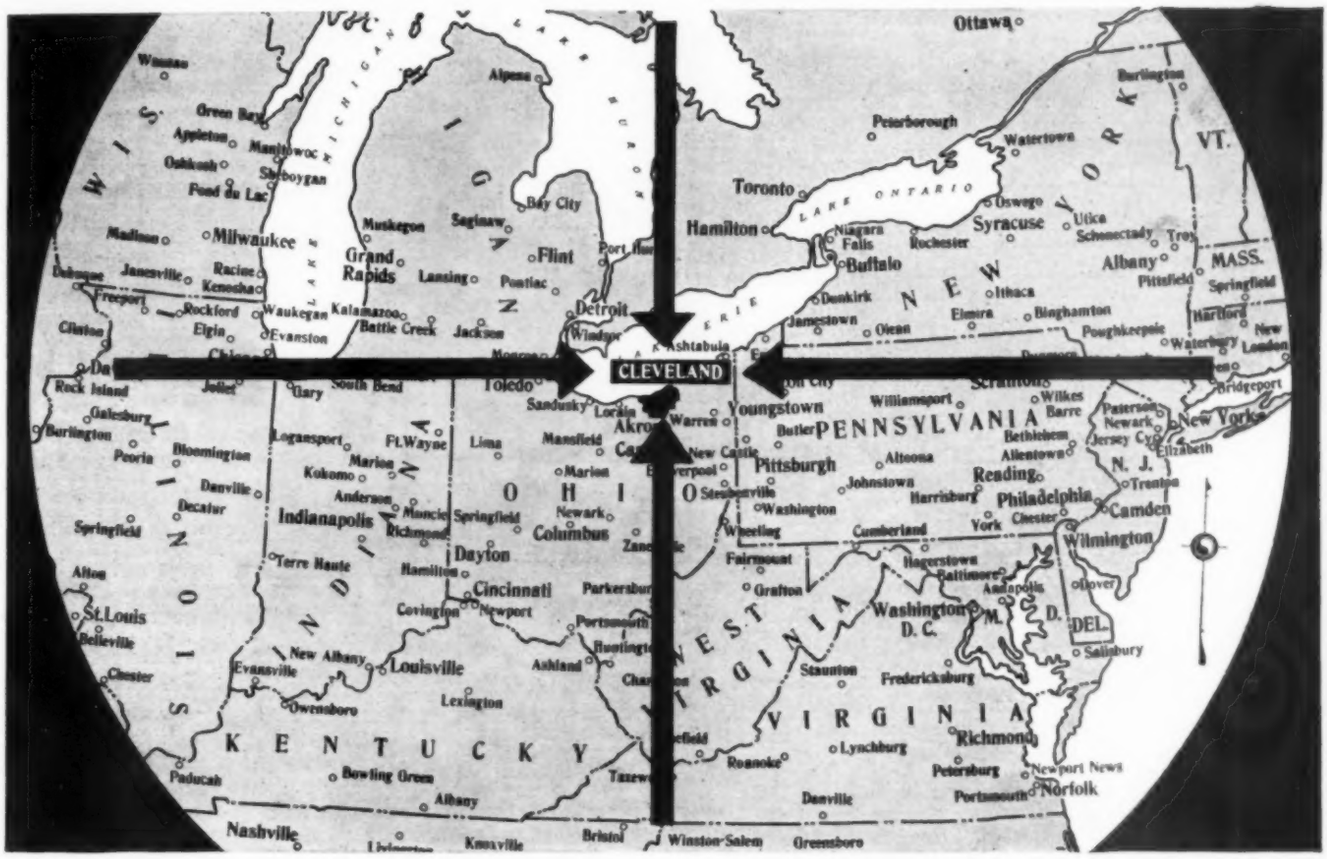
Wall thickness of the hose is somewhat greater than the standard type to permit installation of the wire without materially reducing the cushion effect of the tube. Construction consists of a tube, one ply of fabric, wire coils embedded in rubber, then three plies of fabric, and the cover. The hose is manufactured in sizes ranging from ¾ to 3 inches.

Oil Burner

Hauck Mfg. Co., 126 Tenth street, Brooklyn, N. Y., has developed a new proportioning oil burner which is said to maintain a straight line air-oil ratio from minimum to maximum, giving accurate temperature control over a wide range. It produces controlled furnace atmosphere with carbon dioxide reading between 13 and 15 per cent. A single lever automatically controls and maintains air and oil supply, and adjusts the primary and secondary air orifices. Low and efficient flame turndown can be obtained.

It is claimed that since the air is controlled by burner nozzle orifices, maximum atomizing air pressure and constant air velocity are maintained at the point of oil atomization. A battery of burners may be operated from one control motor with each burner as its own individual air-oil mixer, not affecting other burners in the group. The burner burns any grade of fuel oil. Tests on several hundred burners indicate a saving of 10 to 15 per cent in oil consumption in various heat processing operations.

"In the Center of Everything"



THE 1938 FOUNDRY SHOW!

Cleveland, Ohio. May 14-19, 1938

The 1938 Foundry Show will be held "In the Center of Everything" . . . at the Cleveland Public Auditorium—in the heart of the Foundry Industry—May 14, 15, 16, 17, 18, 19, 1938.

Cleveland is on the main routes of rail . . . . air . . . . motor . . . . and water travel. It is the hub of Metal Working America. Within its boundaries and within easy driving distance from it lies 67% of the Nation's foundry capacity. This assures a large attendance and unique opportunity to know leaders in the foundry industry.

1938 will carry on a 42-year tradition of progressively improved Foundry Conventions, staged by the American Foundrymen's Association. There will be progress in methods of conducting sessions . . . . in educational programs . . . . in presenting exhibits . . . . in facilities for the individual to get what he is seeking.

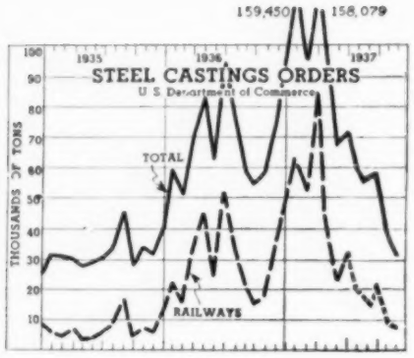
There will be special sessions and other events for Gray Iron, Non-Ferrous, Malleable and Steel Foundrymen.

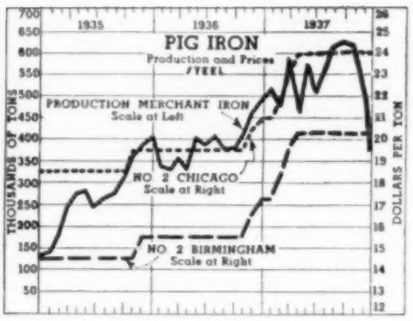
The 1938 Foundry Show gives exceptional opportunity to all who manufacture or use the materials, supplies and machines that facilitate foundry operation. Make your plans now to attend this outstanding industrial meeting.

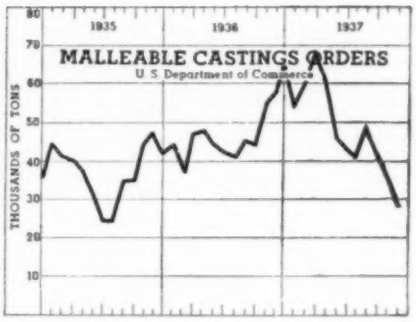
For information about any phase of the Convention and Exhibition, write—

THE AMERICAN FOUNDRYMEN'S ASSOCIATION, Inc.

222 WEST ADAMS STREET, CHICAGO, ILLINOIS







FOUNDRY ACTIVITIES

CITY PATTERN WORKS, Detroit, has purchased a tract of land on Oakland avenue between Manchester and Victor, 272 x 640 feet, and will build a new plant. The first unit will be a nonferrous foundry building and this will be followed by a modern machine shop, pattern shop and office building. In addition to patterns, the foundry of the City Pattern Works specializes in castings for electric welding machines as well as many other electrical devices. The largest product from the casting shop is pure copper castings of high electrical conductivity. The company also produces Mallory castings, beryllium copper, Everdur and other nonferrous alloys. Vaughan Reid is president of the organization.

* * *

Industrial Foundry Inc., New York, has been incorporated to manufacture castings.

* * *

Indianapolis Brass & Aluminum Foundry Co. has moved into new quarters at 950 East Maryland street, Indianapolis, according to Clay Bush, vice president and general manager. The new plant, recently completed, is 110 x 60 feet. The foundry, which is affiliated with the Sonith Pattern Works, manufactures brass, aluminum, bronze, copper and other nonferrous metal castings in sizes ranging from a fraction of an ounce to 1000 pounds. Besides Mr. Bush, officers of the company are Ivan W. Smith, president, and Laura M. Bush, secretary and treasurer.

RAW MATERIAL PRICES
January 21, 1938

Iron	
No. 2 foundry, Valley	$24.00
No. 2 Southern Birmingham	20.00
No. 2 foundry, Chicago	24.00
No. 2 foundry, Buffalo	24.00
Basic, Buffalo	23.00
Basic, Valley	23.50
Malleable, Chicago	24.00
Malleable, Buffalo	24.50
Charcoal iron, furnace	27.00
Coke	
Connellsville beehive premium	$ 5.75 to $ 6.25
Wise county beehive coke	5.50 to 6.50
Detroit by-product delivered	11.10
Scrap	
Heavy melting steel, Valley	$13.50 to $14.50
Heavy melting steel, Pitts. (dlv.)	14.00 to 14.50
Heavy melting steel, Chicago	13.00 to 13.50
Stove plate, Buffalo	13.00 to 13.50
Stove plate, Chicago	8.50 to 9.00
No. 1 cast, New York	12.00 to 12.50
No. 1 cast, mchy., Chicago	12.50 to 13.00
No. 1 cast, Pittsburgh	16.00 to 16.50
No. 1 cast, Philadelphia	16.00 to 16.50
No. 1 cast, Birmingham	14.00 to 14.50
Car wheels, iron, Pittsburgh	15.00 to 15.50
Car wheels, iron, Chicago	15.00 to 15.50
Railroad malleable, Chicago	14.50 to 15.00
Malleable, Buffalo	14.00 to 14.50
Nonferrous Metals	**Cents per pound**
Castings copper, refinery	9.77½
Straights tin	41.62½
Aluminum, 99 per cent	20.00
Aluminum, No. 12 (Secondary, standard)	17.00 to 17.50
Lead, New York	4.90
Antimony, New York	13.75
Nickel, electro	35.00
Zinc, East St. Louis, Ill.	5.00

* * *

Young Foundry Co., 803 North Water street, Saginaw, Mich., recently was destroyed by fire. Loss was estimated at $10,000. Although the main structure of the foundry was burned, the pattern shop and loft were undamaged.

* * *

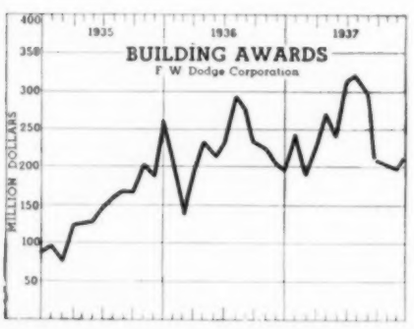
Bremen Aluminum & Brass Products Corp., Bremen, Ind., was purchased at the receiver's sale by Oscar E. Mutti of Bremen. It is reported the plant is resuming operations.

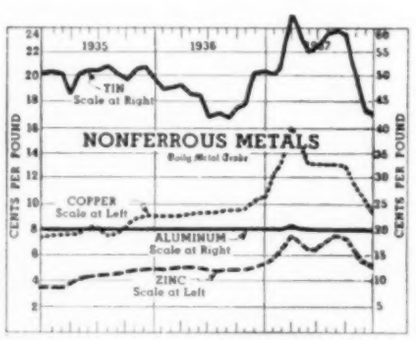
* * *

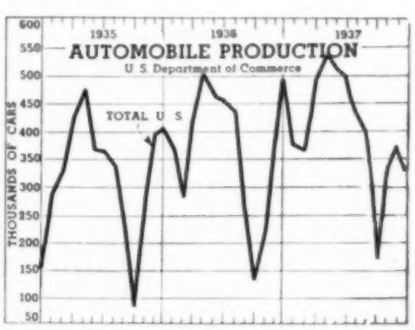
Index of foundry equipment orders for December was 111.2 as compared with 128.03 in November and 283.3 in December, 1936, according to reports of the Foundry Equipment Manufacturers' association, Cleveland. Index of shipments was 159.8 for December as compared with 178.8 in November, and 187.1 in December of last year.

* * *

Bohn Aluminum & Brass Corp., Detroit, will erect a foundry building in Adrian, Mich., including a boiler house. Buckheit & Stuchell, Detroit, are architects.







"Medicine Iron?"... *Yes!*

BUT can and should be used on all classes of work . . . with real economy.

SEVENTY YEARS OF SERVICE TO THE FOUNDRY INDUSTRY

•

Pig Iron Manufacturers since 1868

Silvery Manufacturers since 1890

1868

OLD FULTON FURNACE
40 feet high—4 ft. Hearth
Capacity 10 tons daily

1872

OLD GLOBE FURNACE
Warm Blast—46 ft. High
6 ft. Hearth
Capacity 15 tons Daily

1903

NEW GLOBE FURNACE
Hot Blast—76 ft. High
9 ft. Hearth
Capacity 100 Tons

1912

NEW GLOBE REBUILT
76 ft. High—10½ ft. Hearth
Capacity 120 tons Daily

1932

LATEST GLOBE FURNACE
87½ ft. high. 14½ ft. Hearth
Capacity 250 tons Daily

Embodies all Latest Developments in Blast Furnace Construction

•

Globe Iron Company pioneered and developed all of the products it now manufactures

WE now know that it is better to have the essential vitamins as a regular part of our diet than to wait until we are sick and then get them in medicine. Similarly hundreds of foundrymen have found it easier to keep out of trouble by using Globe Silvery Pig Iron as an essential part of their cupola mix than to wait until trouble develops before calling on this old stand-by.

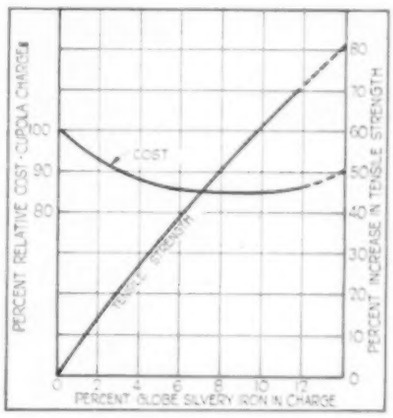
Silvery Iron Will Lower Your Costs

1. BY LOWER MIXTURE COST:

A cupola mixture based on Silvery Pig Iron permits the use of low priced scrap without sacrifice of quality in the iron at the spout.

2. BY IMPROVED QUALITY

Foundries who adopt Silvery Pig Iron as an essential part of the cupola charge are able to meet their customers' requirements. Rejections and complaints due to lack of machinability, breakage, porosity and other causes are reduced to a minimum.


PERCENT RELATIVE COST - CUPOLA CHARGE
PERCENT INCREASE IN TENSILE STRENGTH
COST
TENSILE STRENGTH
PERCENT GLOBE SILVERY IRON IN CHARGE

3. BY INCREASED METAL YIELD:

Silvery users who take full advantage of the improvements possible by the use of Silvery Pig Iron find less iron going to the scrap heap and more iron being shipped out in quality castings.

We invite your inquiries. There is a Globe representative near you—he will welcome the opportunity to study your problems.

NUMBER 1 OF A SERIES

GLOBE IRON COMPANY

JACKSON, OHIO

NEW TRADE PUBLICATIONS

Copies of any of the literature listed below may be obtained by writing directly to the companies involved, or by addressing THE FOUNDRY, in care of Readers' Service Department, 1213 West Third Street, Cleveland

SAND TESTING—Harry W. Dietert Co., Detroit, has issued an illustrated bulletin which describes its equipment for sand testing. Among the machines listed are the sifter, hardness tester, strength tester, washer, and permeability meter.

FIRE CLAY—Illinois Clay Products Co., Joliet, Ill., has issued a leaflet which lists and describes its products.

ALLOY STEELS—International Nickel Co. Inc., 67 Wall street, New York, has published bulletin U-3 dealing with nickel alloy steels for hand tools.

AIR FILTERS—Northern Blower Co., Cleveland, has issued a leaflet which shows its automatic air filters and describes their construction and operation.

REFLECTORS—Miller Co., Meriden, Conn., has published a booklet on its aluminum reflectors which lists and illustrates both ventilated and dust-proof fixtures.

HEAT TREATING—Leeds & Northrup Co., Philadelphia, has issued a bulletin which deals with its electric heat-treating furnaces. Included are several photographs of recent installations.

PUMPS—Pennsylvania Pump & Compressor Co., Easton, Pa., has issued an illustrated bulletin describing the principle of effecting non-leakage dynamic hydraulic balance.

SPRAYED SURFACES—"Metal Sprayed Surfaces in Relation to Lubrication" is the title of a paper by Harry Shaw recently reprinted and issued by the Metallizing Engineering Co., New York.

DUST CONTROL—W. W. Sly Mfg. Co., Cleveland, has issued an interesting leaflet entitled "Dust Storms," by F. A. Ebeling, general sales manager. The text presents an important message to industry.

ELECTRIC MOTORS—Reliance Electric & Engineering Co., Cleveland, has issued two bulletins on its electric motors. The first, No. 122, deals with splash-proof squirrel-cage motors, and the second with explosion-proof motors.

SAND — Several pamphlets have been issued by the Harry W. Dietert Co., 9330 Roselawn avenue, Detroit, on sand testing and control. Equipment used for testing is described and a sand control program offered.

COUPLINGS—Ajax Flexible Coupling Co., Westfield, N. Y., has published a booklet of data sheets covering the types of its flexible couplings. Contents are confined to the presentation of technical data for engineers and draftsmen.

DUST COUNTERS—Bausch & Lomb Optical Co., Rochester, N. Y., has issued a bulletin dealing with dust counters of the impinger type. The bulletin explains the function of the equipment and defines its usefulness in frequent routine checks of dust concentration.

GRINDING WHEELS — Abrasive Co., Tacony and Fraley streets, Philadelphia, has published a pamphlet and price list on its line of resinoid bonded, nut-inserted disks and cylinder wheels. Important features of the disks are listed.

PROTECTION — Metropolitan Life Insurance Co., industrial health section, New York, has published a booklet on "Health Protection of Welders". Hazards include those from fire and electricity, radiant energy, gases, fumes and dust.

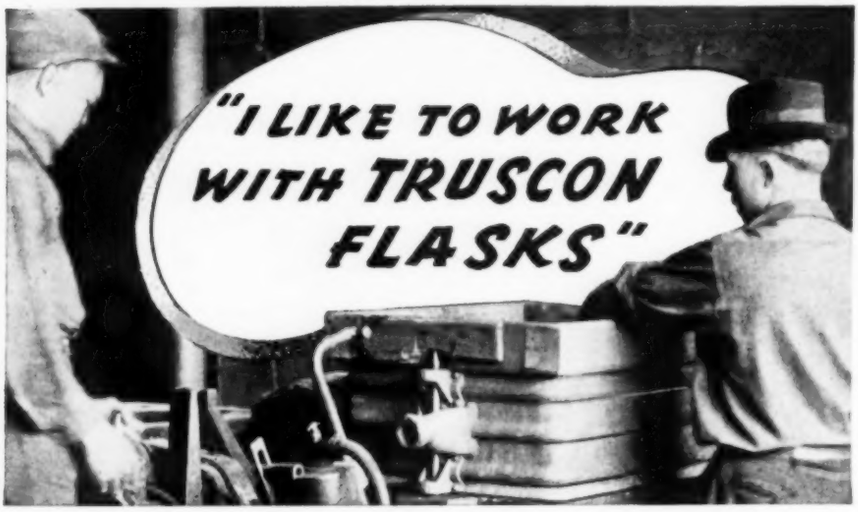
CONVEYORS — Standard Conveyor Co., North St. Paul, Minn., has issued a bulletin on conveyors for steel mill, foundry, and machine shop handling problems. Many illustrations have been included to show installations and improvements of the equipment.

COMPRESSORS — Chicago Pneumatic Tool Co., 6 East Forty-fourth street, New York, has issued a pamphlet describing its line of portable and stationary type diesel driven compressors. Information also is given on aftercoolers for removing oil and moisture.

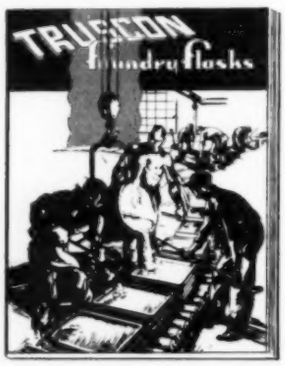
MICROSCOPES — Bausch & Lomb Optical Co., Rochester, N. Y. has published a bulletin on its laboratory microscope equipment for dust specifications. Information is given on counting, measurement, dark field equipment, identification, and accessories used.

COMPRESSORS — Pennsylvania Pump & Compressor Co., Easton, Pa., has pub-

(*Continued on page* 98)



• The *light weight* of Truscon Steel Flasks makes them easy on the muscles. *That's why molders like them.* • The *great strength* of Truscon Steel Flasks makes them easy on the costs. *That's why management likes them.* • Men and management of any foundry where Truscon Steel Flasks are used agree that these flasks are *"just about 100% okay!"*



WRITE FOR FREE COPY OF NEW TRUSCON CATALOG

Truscon Steel Flasks for light, medium and heavy castings in a wide range of standard shapes and sizes are illustrated and explained in this new catalog. Send for your copy NOW!

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TRUSCON
COPPER-BEARING STEEL FOUNDRY FLASKS

Handle BIG STUFF ECONOMICALLY TOO

Coleman Car-type Ovens Handling Heavy Cores in Large Tractor Foundry.

Large Coleman Car-type Oven. World's Largest Steel Foundry.

The econonical drying and baking of your big molds and cores depends on two important considerations:

1. Your large oven must produce a uniform high quality of work, within the shortest possible heating time.
2. It must be designed and constructed for efficient utilization of heat.

Coleman Car - Type Core and Mold Ovens have established a reputation for dependable performance in hundreds of American foundries. Utilizing any available fuel and designed by experienced engineers to meet your individual requirements, these big ovens insure high-quality cores and molds at a very satisfactory production rate.

Every Coleman Car-type Oven installation is arranged to handle heavy cores and molds with facility. The big insulated doors open and close easily and prevent excessive heat losses. Every detail is carefully calculated to provide utmost economy of fuel and labor, regardless of size.

For complete detailed information just drop a line to

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Foundry Equipment Co.
Manufacturers of Coleman and Swartout Ovens
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Coleman
Foundry Ovens
also built in other types:
Portable-Rack
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Conveyor, Shelf, Portable, etc.

Utilizing whatever fuel is most convenient in your vicinity—coke, coal, gas or oil. Complete information on any type sent promptly on request.

Also a complete line of Industrial Ovens for product finishing, etc.

COLEMAN
CORE and MOLD OVENS

(*Continued from page* 96)

lished a 24-page catalog on its duplex air and gas compressors. Data are given on details of design and construction of both the compressor and auxiliary equipment.

BLASTING — Pangborn Corp., Hagerstown, Md., has published a folder briefly illustrating and describing the equipment used to clean motor blocks by the Buick Motor Car Co. Likewise, information is given on the rocker type barrel.

CUTTING CAST IRON — Linde Air Products Co., 30 East Forty-second street, New York, recently has issued its booklet "How To Cut Cast Iron" in revised form. The text treats the cutting of scrap cast iron by means of oxy-acetylene cutting tools.

VIBRATOR — Ajax Flexible Coupling Co., Westfield, N. Y. has published a folder on its reciprocating drives for screens, conveyors, feeders and bins. Three simple mountings are shown and bulletin No. 20 describes and lists the various stock sizes of drives available.

TIME CONTROL — National Acme Co., 115 East 131 street, Cleveland, has published bulletin 3707 on the chronolog, an instrument which maintains a running record of time and a count of pieces on the job, and prints the information on a chart which may be read easily.

METERS—A 16-page illustrated bulletin has been prepared by the Roots-Connersville Blower Corp., Connersville, Ind., which describes not only the general operating principles of its rotary displacement meters, but also lists meters for smaller volumes than in previous bulletins.

SPRAY GUN — Binks Mfg. Co., 3114 Carroll avenue, Chicago, has published a folder giving instructions on operation and maintenance of its new spray gun. The folder treats in detail the most prevalent causes of spreading and pattern distortion and tells how to correct them.

ELECTRIC FURNACES—General Electric Co., Schenectady, N. Y., has issued a bulletin containing descriptions of its furnaces for heat treatment, with information on loading, temperature control, and equipment for supplying protective atmosphere.

LATHES — South Bend Lathe Works, 520 Niles avenue, South Bend, Ind., has prepared catalog No. 46 dealing with a new 9-inch workshop precision lathe. Text describes the design and construction of the various parts and gives details on attachments and methods of operation.

DUST COLLECTORS — Claude B. Schneible Co., 3951 Lawrence avenue, Chicago, has published catalog No. 110 covering its multiwash dust collectors.

The catalog includes many installation views, specifications, air volume and velocities, and details on dewatering tanks and pumping equipment.

HARD FACING — Linde Air Products Co., unit of Union Carbide & Carbon Corp., 30 East Forty-second street, New York, has published a folder entitled "Steel Hard-Facing Procedure". Detailed instructions are presented for applying the hard-facing material, stellite, to steel wearing surfaces.

ELECTRICAL EQUIPMENT — General Electric Co., Schenectady, N. Y., has published pamphlets on its finger contacts, outdoor switch houses with metering equipment and its unit, forced and natural convection type heaters. Construction details, application, tables and other data are included.

DIESEL ENGINES — A bulletin No. 768 on its line of continuous, heavy-duty diesel engines has been issued by the Chicago Pneumatic Tool Co., 6 East Forty-fourth street, New York. Typical design, salient features including construction, and engine specifications are given.

(*Concluded on page* 100)

D. S. M.
CORE BAKING OVENS

Selecting the right type of baking oven should of course be determined largely by your conveying or handling problem.

The conveyor and coremakers shown above are directly under a three pass horizontal continuous D.S.M. oven, 165 ft. long, in a large automotive foundry in Flint.

The monorail conveyor is loaded as it travels past the coremakers who are working at both sides of the conveyor. This oven is baking the output of between 30 and 40 coremakers. The product is uniform, whether loaded on the top tray or the bottom one. Small pin cores weighing about ten to the pound are baked on the same carriers which convey ten or twelve pound cores—and without burning or over baking. This is a result of proper air conditioning.

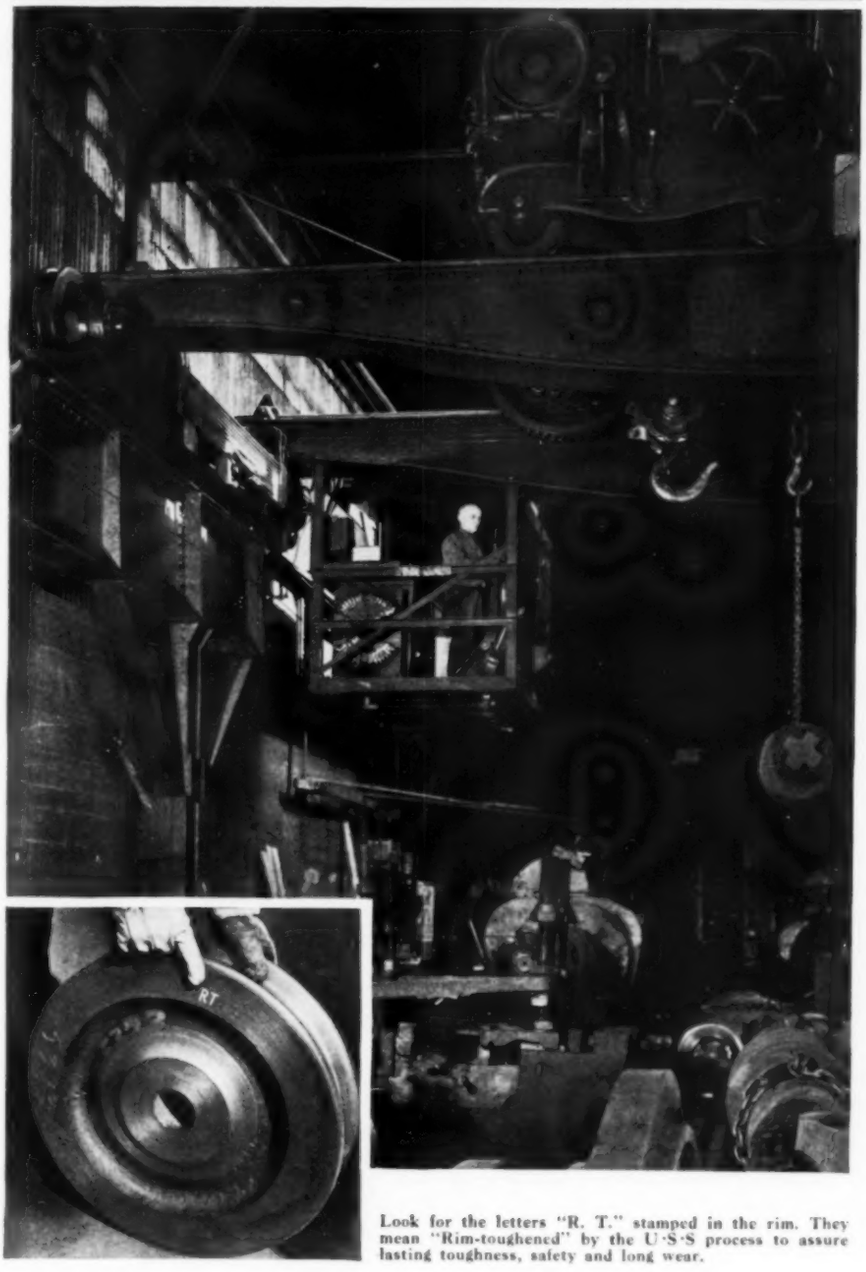
We advocate vertical ovens wherever practicable. But for certain core room layouts the overhead horizontal oven fits better.

DETROIT SHEET METAL WORKS
DETROIT - - MICHIGAN
1270 Oakman Boulevard

Faked Foundry Facts

"Corrugated Fastener"

Take a TIP from the Railroads



Look for the letters "R. T." stamped in the rim. They mean "Rim-toughened" by the U·S·S process to assure lasting toughness, safety and long wear.

Equip your overhead "Rolling Stock" with U·S·S Wrought Steel Crane Wheels

THERE'S no escaping it—in crane wheels, as in railroad car and locomotive wheels, *mileage* and *safety* are the deciding factors. In high-duty railway service—on locomotives, tenders, and passenger cars, where the going is tough and maximum safety is required — U·S·S Wrought Steel Wheels are standard. To meet like demands for safety and service, builders of the world's finest cranes are using U·S·S Wrought Steel Crane Wheels.

Mileage—Fine crane manufacturers have found that U·S·S Wrought Steel Crane Wheels outlast ordinary wheels by approximately 2½ to 1.

Safety—Scientifically designed and manufactured with utmost precision, these high-quality wheels are strong enough to withstand the most strenuous crane service, with a liberal margin of safety to spare.

It's sound economy to specify U·S·S Wrought Steel Crane Wheels for your new equipment and for replacements. An exclusive rim-toughening process toughens their treads and flanges, making them wear exceptionally slowly and evenly. Correct finish machining, assuring proper bridge alignment, adds thousands of miles to their useful service life.

U·S·S Wrought Steel Crane Wheels, double flange or single flange, are furnished rough machined or finish machined with finish bore and keyway—rim-toughened or untreated, as desired. Write for complete data.

U·S·S WROUGHT STEEL CRANE WHEELS

CARNEGIE-ILLINOIS STEEL CORPORATION

Pittsburgh *Chicago*

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

ADVERTISING PAGES REMOVED

(Concluded from page 98)

POWER COSTS—Troy Engine & Machine Co., Troy, Pa., has published bulletin No. 101 dealing with the mechanical and operating advantages of modern steam engines and the savings in power costs which they have effected in recent installations.

ELECTROMAGNETS—Publication No. 23 of Electromagnets Ltd., Birmingham, England, is an illustrated catalogue of the company's lifting magnet equipment and magnetic separators. The catalogue includes many pictures of separation equipment for foundry use.

TOOLS—Ideal Commutator Dresser Co., Sycamore, Ill., has issued an illustrated leaflet describing a few of the tools and machines which it manufactures. Among those listed are cleaners, mica undercutters, wire skinners, saws, and grinders.

CLEANING METAL SURFACES—Hilo Varnish Corp., Brooklyn, N. Y., has issued a new bulletin on the mechanical and chemical cleaning of metal surfaces. It sets forth fundamentals of practice for manufacturers using decorative and protective coatings.

BEARING BRONZE—Riverside Foundry & Galvanizing Co., nonferrous division, Kalamazoo, Mich., recently has published a bulletin entitled "This Is Our Story on High Leaded Bearing Bronze" by Henry C. Limbach. Complete information on the bearing bronze manufactured by that company is included in the text.

VERTICAL MOTORS — Fairbanks, Morse & Co., Chicago, has issued bulletin No. 1410 which describes its vertical hollow and solid shaft polyphase, squirrel-cage, induction motors. Special features of hollow shaft motor construction and installation are listed and illustrated in detail.

DEGREASERS—G. S. Blakeslee Co., Chicago, has published a new bulletin describing its vapor spray and immersion degreasers. The bulletin discusses the application of the machines to degreasing of large and small units, and is illustrated with photographs of the equipment and details of construction.

PYROMETERS—A new bulletin, No. 493, issued by the Bristol Co., Waterbury, Conn., briefly describes a newly developed potentiometer which may be used as a pyrometer, a resistance thermometer, a tachometer, and a millivoltmeter. Bulletin No. 494, from the same company, illustrates applications and outlines special features of its electric flow meters.

THERMOMETERS — Foxboro Co., Foxboro, Mass., has prepared a bulletin 198-1 on its recording thermometers. A brief story on the value of thermometers is followed by a separate description of the thermometers associated with Foxboro manufacture. Data include range characteristics, appearance, thermosystems and special bulbs.

ELECTRIC MOTORS—Century Electric Co., St. Louis, has published a 24-page booklet which presents in helpful form information concerning the electrical characteristics of its fractional horsepower motors, and suggests how these characteristics can be most effectively applied to motor driven machinery and appliances.

CORE HEATERS — Willsea Works, Rochester, N. Y., has issued a temperature chart of one of its ovens with a list of the equipment's operating economies.

SALT DISPENSERS—Mine Safety Appliances Co., Pittsburgh, has issued an illustrated leaflet which describes the construction, use, and advantages of its salt tablet dispensers.

HELMETS — W. W. Sly Mfg. Co., 4700 Train avenue, Cleveland, has published two folders, one dealing with its pure air blower, which eliminates possibility of contaminated air for workmen, and the other the pure air helmet used as a protection against dust, fumes, etc. Data show the design and use of the equipment.

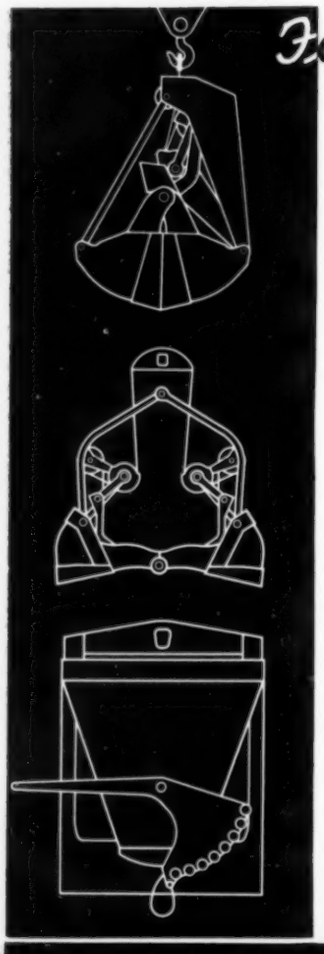
VENTILATORS — Swartwout Co., Cleveland, has published catalog section *B* as bulletin No. 205, which describes controlled air circulation for industrial and commercial buildings. Features of design and construction, capacities of rotary ventilators, wind velocity factors and typical installations are contained in the bulletin.

Index Available

AN INDEX of all articles published in THE FOUNDRY during 1937 and giving a complete reference and cross reference to the material which has appeared in each of the issues, has been prepared for distribution. Readers who bind or preserve the back issues of this publication will find the index of great value in referring to articles which have been published. A copy of the index will be mailed free of charge to any subscriber who requests it from THE FOUNDRY, Reader's Service Department, Penton Building, Cleveland.

BLAW-KNOX BUCKETS

For Foundry Service



The popular hook-on bucket for handling sand, coke, coal, etc. Adaptable to a broad range of service and multiplying the value of your crane investment.

A Hook-on type of bucket built especially to meet the requirement of extremely limited head room clearance for operation.

The roller gate dump bucket presenting the first practical means of obtaining controllable discharge for delivering sand to floor or flasks, etc.

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